RAILROAD GAZETTE

FRIDAY, DECEMBER 5, 1902.

CONTENTS

ILLUSTRATED:
The Grand Trunk Line to the Pacific 920
The Koerting Gas Engine 922
The McKenna Train-Order Holder 922
Two High-Speed Electric Cars 923
A Sliding Chafing Iron for Passenger Couplers 924
Virtual Grades for Freight Trains 924
Consolidation Locomotive for the Baltimore & Ohio. 928
A Large Universal Wood Worker 929

CONTRIBUTIONS:
Speed on the Northern of France Railroad 919
The De Glehn-Du Bousquet Compounds 919

EDITORIAL:
Live Stock and Other Rates in the West 926
Annual Reports; Chicago & Eastern Illinois 926
Editorial Notes 926, 927
New Publications 927
Trade Catalogues 927

MISCELLANEOUS:
Imports and Exports of Iron and Steel and Products 919
Per Diem as a Standard of Measurement and Per Diem Rules as Practically Applied at St. Louis Terminals 919
The Chilled Iron Car Wheel 920
Foreign Railroad Notes 920
The Water-Tube Boiler in the American Mercantile Marine 920
The Use of Graphite in Air-Brake Triple Valves .. 922
Interstate Commerce Commission Income Report for the Year to June 30, 1902 922
British and American Railroad Methods 923
Records of the Life of Cross-Ties 925
A Boiler Explosion in Chicago 925
Improvements on the Union Pacific 925
Railroads and Their Relation to Municipalities 927

GENERAL NEWS:
Technical 929
The Scrap Heap 930
Locomotive Building 931
Car Building 931
Bridge Building 931
Meetings and Announcements 932
Personal 932
Elections and Appointments 932
Railroad Construction 933
General Railroad News 934

Contributions

Speeds on the Northern of France Railroad.

Paris, Nov. 19, 1902.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the article on the recent Nord compounds Oct. 10, p. 769, and in the note of Nov. 7, p. 861, you state that the speed frequently rises to 80 miles an hour. This statement is, I am sure, based on an entire misconception of my words. I have never once got a speed of 80 miles an hour, but in certain trials on one occasion the speed did rise to 78, or three more than the legal maximum, but only in this instance and on a special trial. I may add that during all my experience on the Nord the speed of 75 miles an hour is rigidly adhered to, and from personal observations I can vouch for its being strictly observed. YOUR EUROPEAN CORRESPONDENT.

The De Glehn-Du Bousquet Compounds.

Purdue University,
LaFayette, Ind., Nov. 14, 1902.

TO THE EDITOR OF THE RAILROAD GAZETTE:

A letter just received from Mr. J. T. Burton-Alexander, England, referring to my paper in your issue of the 17th inst.,* contains statements of such general interest that I venture to transmit to you the substance of them.

With reference to the difficulties to be overcome in designing a de Glehn type of compound having more than four coupled wheels, he calls attention to the fact that the Northern Railroad of France has in service at least 180 six-coupled express engines of the four-cylinder type, in which the low-pressure cylinders drive the leading axle and are inside the frames, while the high-pressure cylinders drive the middle axle and are outside the frames. Another French line (Midi) has recently placed in service two four-cylinder compound engines of the consolidation type.

He adds that while M. de Glehn is to be credited with having originated the system great help was given him by M. du Bousquet, of the Northern Railroad of France, who, after having evolved a compound system of his own, recognized the superior advantages of the de Glehn design, and abandoning his own in its favor, devoted himself to its development. W. F. M. GOSS.

Imports and Exports of Iron and Steel and Products.

Figures of imports and exports for the month of October, published by the Bureau of Statistics, show that there were 102,294 tons of iron ore imported during that month, against 82,871 tons for the same period in 1901; the total for the 10 months ending with October was 997,531 tons, an increase of about 190,000 tons over the last year. The pig iron imported in October was 67,204 tons against 5,371 tons in October last year. There was also a very great increase in the importation of ingots, blooms, billets, steel bars, etc., during October of this year which amounted to 35,880 tons against 952 tons; the total for the 10 months ending October was 248,652 tons against 7,395 tons of last year.

Notwithstanding the large increase in imports of ore the exports of iron ore during October amounted to 21,499 tons, an increase of over 10,000 tons over the previous year. The exports of iron ore for the 10 months reached 86,806 tons, against 60,534 tons of 1901. There was an increase of almost 100 per cent. in the exports of steel bar or rods during October, and the total for the 10 months reached 20,436 tons against 6,730. There was also a large decrease in the amount of merchant steel exported during October of this year, which was only 2,195 tons against 18,657 tons of 1901. Likewise for the 10 months the decrease was large, the export being 65,266 tons against 285,380 tons of 1901. There was hardly any difference in the amount of structural iron and steel exported during the month of October and for the 10 months.

During October there were exported 1,484 car wheels against 1,414 for the previous year, and during the 10 months ending with October, the total number of car wheels exported was 18,266 against 22,367. The number of locomotives shipped out of the United States during October were 19, against 28 of the previous year. But none of these left the North American Continent. Thirteen went to Canada and six to Mexico. Locomotives exported during the 10 months numbered 295 against 378 of the same period of 1901. Most of the locomotives shipped this year have gone to Canada and Mexico.

*Possibilities in American Locomotive Design.

Per Diem as a Standard of Measurement and Per Diem Rules as Practically Applied at St. Louis Terminals.

A paper on the above subject was presented to the November meeting of the St. Louis Railway Club by Mr. W. M. Prall, Manager Central Car Service Association, in which various deductions were made from the application of per diem rules in the St. Louis and East St. Louis terminals.

The similarity in the underlying principle of car service association and of per diem rules was pointed out, both being to the end of improving car movement; the one to free the car from its load, the other to expedite movement of the car. It was declared that per diem has been as effective in its way as car service association rules have been in theirs, the increased loaded car movement through the St. Louis terminals being approximately 7 per cent.; and statements from various railroads throughout the country show equally good results. Improved service in handling business into and out of division points, and at terminals in transferring business to connections, means ability to handle increased tonnage over the line and consequent increased earning power.

However, results of the application of per diem at the larger termina's have not worked out with the same degree of satisfaction as for division points and smaller terminals. Concerning this, Mr. Prall says:

They (per diem rules) are only more or less of a success for obvious reasons. More a success because the cars have moved more freely. Less a success in that there is no general agreement upon which to base a proper debit for accounting between connections.

The St. Louis Per Diem Association is now approaching accuracy of working on the credit basis; that is, working from the reports of its members as recorded in station records for interchange; using the per diem interchange report as the record of receipt and the same report when cars pass over its rails to a connection as the record of the car delivered.

The report, in accord with the agreement to be signed by the delivering and receiving agents, was expected to be an accurate record of the actual interchange of cars. Theoretically, accuracy was provided for. Actually, the reports are the same old inaccurate, indifferently made switch lists that have been used in interchange for years. They are made under the old conditions, the same old surroundings, the clerks lacking the supervision which is necessary in order to approach to accuracy. The consequence in the station record is the development of innumerable errors.

Where cars are directly delivered to a connection the adjustment can quite easily be made, but where cars in interchange pass through from one to four switching lines before delivery to a line for unloading, the possibilities of inaccuracy are increased in proportion, and as each agent develops his inaccuracies on different cars the percentage of inaccurate reports to the volume of business handled runs into double figures and when such reports are audited independently, it is almost an impossibility to adjust the discrepancies.

Mr. Prall gave a report of the cars delivered in the month of August to convey an idea of the business handled at the St. Louis terminal; the report shows the division of the business among the roads in interchange and includes no private line cars. The cars delivered by carrier lines to connection were shown separately from those delivered by belt and transfer line connections. These deliveries were as follows:

Carrier line delivery	115,611
Transfer line delivery	100,567
Total deliveries	216,178

It was pointed out that this statement shows that approximately six out of every seven cars interchanged at the St. Louis terminal are handled through a connecting line.

It is a fact that most of the larger industries in St. Louis and East St. Louis are situated on the tracks of but seven of the roads to be found there, the other lines using the terminals of these seven for almost all of their deliveries, except placing cars on public tracks or at elevators. From this will be understood the immense movement of cars in interchange and the difficulty of registering a car's movements.

In regard to the benefit derived from per diem, the paper says:

The benefit of per diem to the St. Louis terminal is in the fact that the empty car is carefully supervised in its movement as was the loaded car prior to the agreement of July 1. In other words, to-day it is not only the loaded car, but it is the empty car that receives the attention of the agent, the general yardmaster and all their subordinates to the end of the quickest possible movement into and out of the terminals.

In all commercial business, manufacturing included, the accounting is based upon the output; in railroading there is a reversal of method, in that the delivering agent is debited from impression copies of the billing of the forwarding agent. The method is a simple one and has been adopted by every railroad accounting office in the United States, but that method carrying with it the necessity for a debit made from the records of the forwarding agent will not properly audit per diem accounts in terminals where the forwarding agent is not under the control of the record office.

In order to clear cars under per diem at large terminals the principle as applied on all the roads in their other accounts must necessarily be applied at the terminals. That is, the terminal must be handled as if it was a trunk line, an auditor appointed to audit all cars interchanged at that terminal, the agent furnishing an impression copy of a bill for every car delivered to connection, of necessity an impression copy of every car way-bill because it is just as necessary to have a way-bill for an empty car as it is to have one for a loaded car.

Per diem does not excuse any line holding a car that is foreign to its own rails from payment of the per diem to the car owner; consequently, per diem does not differentiate between the loaded and the empty car. An error in the delivery of an empty car results in an accumulation of per diem on all roads handling the cars.

I have a record of cars that have weaved through the St. Louis terminal for from 15 to 34 days, the car being empty the entire time; every agent endeavoring to find a place to place the car, that is, another agent upon whom he could unload the car, until finally one agent found a load in the direction of home and sent it there.

Under a proper system, all the agents reporting to a central office, furnishing the office with the impression copy of their manifests and with reports covering all interchanges, then the central office using the impression copy of the manifests as a debit and the report of interchanges to check the car's movement will be in a position to enter on specially arranged sheets, using terminal numbers for indexing, every car moving between connections, the entry showing the full authority for payment of the reclaims both to the intermediate line and to the final unloading line in accord with the authority of the delivering line, and it will also show a continuous record of the car's movement. The continuous record will be reported to the car owner, the entire movement in the terminal from delivery to completion of movement being shown on one junction card. When entries are so made if cars are reconsigned or if cars are incorrectly handled the detail as exhibited in the central office will immediately attract attention to the car to the end of demonstrating any error that might be made in its movement and to the prevention of its continued weaving between railroads to the detriment of their service.

To illustrate the possibility of occurrence of errors in records where the movement of a car is not controlled by a central authority, a route sheet in use by the St. Louis Per Diem Association was submitted, and the governing conditions and movement of cars explained. One of the routes given on the sheet was taken as an example, the explanation being made that the rule of the short route must govern in these movements, the intermediate charge being divided among the roads in interest in the service.

For the particular route selected the record of claims made by the lines in interest, for July, is an exhibit of error for every car; or the aggregate errors made by the several lines were equal to the cars handled over that route. The total errors for July corrected by the bureau were in excess of 30,000. Each succeeding month has shown marked improvement.

Failure of agents properly to enter in their reports the originating line is one of the chief sources of error in reclaim, necessitating tracing the car through each report in order to find the debtor line.

The paper says in conclusion:

The bureau has been developed until it is made plain that—given copies of the billing so that the absolute debit can be obtained; with additional authority over the interchange clerks in order to attain to uniformity in reporting and an understanding on the part of the clerk as to his duties, the work of the bureau will be fully as efficient in clearing cars as the present auditing departments of the railroads are in clearing the freight accounts of the agents under their jurisdiction. And settlements then made by the auditor of the bureau will protect

the interest of each road in membership. Settlements could be made by balances, eliminating many of the direct reports made to the car accountant's office and the individual auditors of the roads.

The bureau should only do the work that cannot be done better by its individual member. It should be used to simplify the reporting of the car by the agent and in the settlement of the reclaims because acting as the agent of all it becomes, in a sense, the authority for each member, its accounts being justified by the records made by each agent under direct supervision, consequently insuring uniformity of method and accuracy in carrying out the detail.

When cars are interchanged, uniform reports can only be made from two different agencies, if those agencies are working under identical instructions, and the practices under per diem, where each line is working out its own salvation makes it plain that it is almost impossible for two parties, each acting as they think for their own best interest, to agree as to the equities properly due to one another.

It has also been made plain that discrepancies originating on one line are apt to develop discrepancies in the reports of the connecting lines because they are working at cross purposes, and because there is no mutual agreement upon which they can meet to adjust their differences.

Therefore, I reiterate my belief that to make per diem accounting carry out the intent of the per diem agreement it is necessary that there should be a mutual agreement as to the authority and the agency through which the accounting shall be developed and administered.

The Chilled Iron Car Wheel.*

No portion of the equipment used in operating a train, probably excepting the locomotive itself, has been developed to such an extent as the chilled iron car wheel, in point of strength and durability. Back as far as the year 1888, the chilled wheel in freight service was expected to run three years, and was guaranteed for that length of time, under cars with a capacity of 30,000 to 40,000 lbs. Tests and inspections of wheels were practically unknown. Car wheels were supposed to be all right, because the manufacturers thought they were. In the early days little was known or cared apparently for the comparative strength of metals or their analyses. When the drop test was first instituted, wheels were frequently known to fail to meet the requirements of five blows. Test wheels were even said to have broken of their own weight when thrown flat for the test; test bars were "good enough" if they broke at 1,800 to 2,000 lbs. transverse strain. To-day, bars will withstand a load of 3,500 lbs. twice, without breaking.

It may be safely stated that good car wheel iron will develop 50 to 150 per cent. greater tensile strength than ordinary cast iron, and can be and is made to closely approximate the strength of puddled steel quoted by Mr. Kirkaldy at 62,720 pounds, as the result of many experiments, while the Society of Civil Engineers (England) gives the tensile strength of Bessemer steel as 76,653 lbs.

To meet the constantly increasing demand for wheels which will carry at least double the maximum load permitted six years ago, the up-to-date car wheel foundry has found it necessary to give particular attention to mixtures; to the grading and analysis of different irons used; to uniform shop practice; to careful inspection of the finished product, etc. Much interest has developed in the experiments made at Niagara Falls last year, and again this summer conducted by Mr. A. J. Rossi, C. E., in the electrical smelting of titaniferous ores. Iron containing titanium is known to be of great value in car wheels, having the effect of hardening the treads and strengthening all parts of the wheel, including the plates, but the real or imaginary difficulty of smelting titaniferous ore has prevented its general use up to the present time. Mr. Rossi, however, has been indefatigable in developing this element.

The writer has a letter under date of Sept. 5, 1902, from Mr. Rossi, in which he states "all the objections against titaniferous ores seem to have been destroyed one after the other. In a number of experiments I have melted in a crucible a great number of mixtures with various fluxes at temperatures below those attainable in a blast furnace. "As you can remember, the slags at Buffalo contained from 30 to 35 per cent. titanic acid. Analysis shows from .30 to .70 silican with sulphur as low as .047, and phosphorus below the Bessemer limit. Both ores contain carbon in combined and graphite state, although in the white pig it is nearly all combined."

Our own experiments with the metal demonstrate that titanium in iron gives greater density to the metal, surprisingly increases transverse strength and gives a harder chill or wearing quality in the wheel. This is no light statement when it is remembered that the tread, or wearing surface of a car wheel, is already harder than steel —in fact a rough section of chilled car wheel iron will cut glass.

The clearly demonstrated practicability of supplying in one casting a wheel with a hard tread for wear and a soft hub for machine work, with strength only limited by the price which the purchasing agent is willing to pay for it, makes the chilled cast iron wheel stand forth as its own probable successor in carrying the heavy traffic of the future. To increase the incentive for making good wheels, and to follow that up with still better wheels, a system could be, and I think should be, devised whereby a premium for additional mileage would be allowed to the manufacturer, or a proportionate increase in selling price be paid for increased strength and higher grade material, as developed and demonstrated by tests arranged for the purpose.

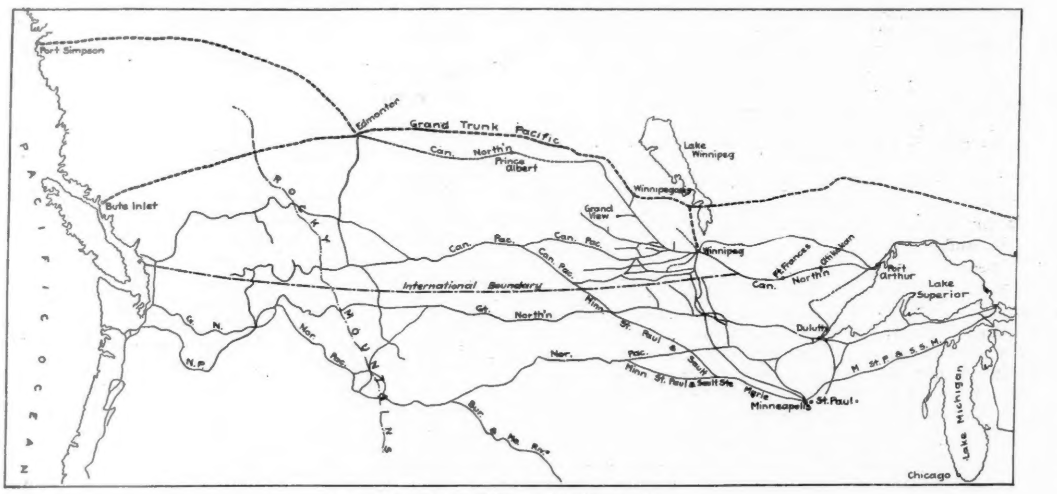
Suppose, for instance, that the wheel now making 60,000 miles could as readily make 100,000 miles if a reasonable percentage were allowed the manufacturer for any mileage made above the 60,000, thus justifying the use and enabling the wheel maker to use, the more expensive materials necessary to attain the increased mileage. Assuming that it costs a railroad not less than $3.50 to replace a wheel, including the differential between the value of the old wheel and the price of the new wheel, and including the labor involved in the replacement, why should it not be more economical to pay, say 50 per cent. of this differential to the manufacturer and obtain nearly, if not quite, 100 per cent. more mileage? Again, if ten blows are a safe limit in the drop test, why not allow the manufacturer a percentage for his efforts if 20 or 30 or 50 blows are obtained, and by the same token allow him something if a wheel supposed to stand two minutes in thermal test stands it for three or five or ten minutes?

All of these results as to increased number of blows and longer time in thermal test are obtained every day in experimental work, but it cannot become common practice until existing conditions are modified and consumers awake to the possibilities open to them.

*Abstract of a paper presented to the Railway Club of Pittsburgh, Nov. 28, 1902, by Mr. C. V. Slocum, President of the Keystone Car Wheel Company.

The Grand Trunk Line to the Pacific.

Last week we printed, in the department of Railroad News, a note about the announcement that the Grand Trunk Railway System is to be carried through to the Pacific coast. The sketch map which we are now able to publish shows the general idea of the new lines. It goes without saying that these lines are only approximate. They must be determined later on by explorations and actual surveys. Furthermore, some legislation must be had by the Dominion Parliament.



The Grand Trunk's Pacific Extension.

The undertaking involves building 2,500 to 3,000 miles of line which, equipped, will cost perhaps as much as 100 millions. The line will be built by a new corporation, the Grand Trunk Pacific Railway Company, and it is hardly necessary to say that it will be a highly modern road with the lowest obtainable grades. It will probably leave the Grand Trunk road at a point between Toronto and North Bay and will connect with the Clergue road at Sudbury and reach Port Arthur. It will run through Northern Ontario, Manitoba, Saskatchewan, Assiniboia and Alberta.

The project has been under consideration for a long time and was finally agreed to during a recent visit to England by Mr. Hays, and the Directors are now ready to push the project with the view of finding a terminus on Butte Inlet or at Port Simpson. Port Simpson is 500 or 600 miles north of Vancouver, the Pacific terminus of the Canadian Pacific. Underlying this colossal project is the feeling of the great importance of getting into the rich territory of the northwest.

Foreign Railroad Notes.

The French railroads had a considerable decrease in earnings in 1901, due, doubtless, partly to the unusual passenger traffic in the World's Fair year, but also to a general depression in business similar to but less marked than that in Germany and Austria. For the first nine months of 1902 they show an increase of about 1 per cent. over 1901—which means that the depression continues but does not tend to sink further.

Sweden has very little coal, and that very poor, and nearly all its locomotive fuel is imported from England. It has, however, almost inexhaustible peat deposits; and to utilize these experiments have been made lately with a heavy compound locomotive, the grate surface of which had been increased 50 per cent. to suit the fuel. The experiments have been, it is said, in the main satisfactory. About 1.8 tons of peat are required to do the work of a ton of coal, and it requires two men to fire the engine. At moderate speeds fewer sparks escaped than had been expected. The cost per mile was about the same as with coal, and the chief advantage from its use would be the utilization of a home product. Even peat costs about $2.75 per ton there. A sort of rack is required on the tender to enable it to hold enough. It is thought practicable to use the peat for freight trains.

A comparison of the average freight rates per ton on the six great railroads of France in 1895 and 1891 shows them to have been, reduced to cents per 2,000 lbs. per mile:

	Eastern.	P.-L.-M.	Southern.	Northern.	Orleans.	Western.
1895.....	1.58	1.643	1.630	1.251	1.557	1.427
1901.....	1.31	1.330	1.426	1.138	1.440	1.424

Thus there was an important decrease on every system but the Western, which is the more notable because for a long time before 1895 the reduction had been but slight. The Northern is the great coal road, and its rates have now reached a level which would have been called low in this country 20 years ago.

The Water-Tube Boiler in the American Mercantile Marine.*

The author, in his introductory paragraphs, gives a brief historical sketch of the water-tube boiler in merchant marine service. It is stated that up to the present time the water-tube boiler has not been a success in the mercantile marine and that the only three large installations made on American ships have been failures, Babcock & Wilcox boilers being condemned in one vessel, and Belleville boilers in the other two. The latter two were fitted in the lake steamships Northwest and Northland in 1894, but were finally replaced by Scotch boilers. However, the two trans-Pacific steamships building at New London for the Great Northern Steamship Co. (the largest in the world) will be equipped with the Niclausse water-tube boiler.

The water-tube boiler of suitable type has a future, but great care and caution must be exercised in its design, arrangement and operation on board ship.

A water-tube boiler to prove durable, reliable, give excellent results in the mercantile marine, and grow in favor as a result of its merit until it shall finally displace the well tried and favorite Scotch fire tube boiler, should possess the following essential features:

1. All tubes should be absolutely straight and of uniform length. They should be of seamless drawn steel or nickel steel, very uniform in quality, and as near non-corrosive as is possible, with a ratio of length to diameter not exceeding 30 diameters. These tubes should be submerged and be placed on an angle of about 10 degrees from the horizontal. The boiler should be sectional, with front and back headers, or a compound front header with circulating tubes within the generating tubes. The tubes should be not less than 3 in. diameter, more preferred, and have a thickness varying from No. 5 to No. 8 B. W. G., according to size and location.

2. The steam drum should be placed at the front of the boiler with its center square with the tubes. The water level should be at the center or a little below the center of the drum. The drum should be not smaller than 45 in. diameter when space permits. If back headers are fitted, the steam discharge to the drum should be horizontal and connect to the drum at the water level. The interior of the drum must be made accessible. No part of the drum should be exposed to the hot gases.

3. The headers should be of wrought steel. No cast metal should enter into the construction of any pressure part of the boiler. The proportioning of the relative areas of the headers, uptake and down cast, determine the capacity of the boiler and regulate the circulation.

4. The water circulation must be active and positive, and follow a defined path. The more rapid the circulation of water over the heating surface, the greater the evaporation.

5. The furnace or combustion chamber should be high, at least 3 ft., so as to thoroughly mix the gases before coming in contact with the heating surface.

6. All parts of the boiler exposed to the gases or pressure, particularly the exterior and interior of tubes, should be accessible for cleaning and repairs. It is necessary to keep the outside of tubes free from soot and fine ashes, the latter being especially destructive when moisture, such as is obtained from an attempt to clean from the outside with a steam jet, is present. A boiler composed of tubes that can be drawn from the front for examination possesses great

*Abstract of a paper presented to the Society of Naval Architects and Marine Engineers by William A. Fairburn, November, 1902.

merit. Expanded joints are preferable in many ways, but the necessity of keeping a boiler clean is of vital importance.

7. The boiler should be easily drained without resorting to syphoning or the withdrawal of elements or individual tubes.

8. The headers should be of corrugated form, the tubes being staggered with no straight path for gases between the same.

9. There should be a mud drum or receptacle arranged for the reception by gravity of solid foreign matter separated from the feed water.

10. The path of the gases leaving the furnace or combustion chamber should be approximately square to the tubes, and such that all the heat possible is abstracted from said gases before they enter the uptake. Efficient baffling can only be determined by experiment, and the nature and extent of the baffling will vary for the various rates of combustion. Proper baffling with reasonably good firing will eliminate the criticism of high stack temperature.

11. The air supply to the fires and furnace must be ample, but not excessive. Air supplied under pressure over the fires from all four sides of the boiler may be found desirable. Distance between fire bars is of great importance. Hot air supply and induced draught may be found exceedingly efficient for water-tube boilers.

12. The boiler should never be placed with steam drums forward and aft, and tubes athwartships in any ocean-going vessel, or in any vessel navigating rough waters.

13. The boiler should be capable of being built in any well equipped boiler shop. The parts should be simple and of uniform construction, with as few different parts as is possible. A large number of spare parts to be constantly carried at sea is undesirable. The boiler should be built so that it can be readily repaired by the vessel's own staff, no extra skilled labor being necessary.

14. The boiler should have a large ratio of power to unit of floor space and volume.

15. The boiler must stand forcing and maintained severe service.

16. The casings should be airtight, built of heavier material than is usually used and well insulated throughout in a manner that will stand the test of time.

17. Dry steam must be generated and the steam should have free and unobstructed escape to a steam dome placed at the center of the drum, from which the dry pipe leads to the main steam pipe. No separators or reducing valves should be permitted, having for their object the drying of steam.

18. The feed arrangements should be simple and require no elaborate automatic apparatus.

19. The steam should be generated at a pressure equal to the working pressure of the engines. The boiler must be suitable for high pressure.

20. No screwed connections should be exposed to the gases.

21. Economizers placed in the uptakes are very efficient, but their inaccessibility and great cost of upkeep does not warrant their adoption. The feed water must, however, be injected into the boiler at a very high temperature.

22. The use of induced draught and air heaters, permitting a low stack temperature, making the installation independent of climatic conditions and causing a cool fire room, is considered favorable for a marine water-tube boiler installation.

23. The pressure on feed lines should not exceed the boiler pressure, and the feed system should be such that the amount of air in water is reduced to a minimum.

24. Mechanical stokers or oil fuel will probably be used, and great gains result from better combustion, more regular uniform heat, constant steam pressure, and the prevention of loss of heat caused by frequent opening of fire doors.

25. The boiler must have absolute freedom for expansion.

26. The boiler must respond quickly to any sudden or unusual demand for steam and carry a steady water level.

27. The weight of the boiler should show approximately the same relative advantage over the weight of Scotch boilers as the water-tube boilers discussed in this paper. The parts should be light and easy to handle.

28. The thermal efficiency of the boiler must be equal or superior to that of any fire-tube boiler tested by the same unprejudiced engineer under exactly similar conditions.

29. The boiler must be capable of showing good results when burning inferior coal.

30. A tube should be renewed or plugged without removing any other tube or pressure part, or cooling down the boiler, other than by blowing off the pressure. The component parts should be independent of one another, so that the removal and repairs of one part do not disturb other parts.

31. Sufficient water should be carried in the steam drum to give the boiler a period of about 20 minutes before the water in said drum is evaporated, provided the feed is shut off and the boiler continues steaming easy under the usual natural draught conditions, burning about 15 lbs. of coal per sq. ft. of grate surface per hour.

32. The steam space in cu. ft. should be about equivalent to the grate surface in sq. ft.

33. The ratio of heating surface to grate surface should be not more than 40 to 1, and possibly less for natural draught conditions.

34. Suitability for rapidly raising steam.

35. Must be capable of being built in large units, and if worked entirely from the front, or front and back, side battery construction may prove advantageous.

36. Should consist entirely of cylindrical components with spherical ends, all parts being self-sustaining without staying.

37. The cost should be no more than that of a Scotch boiler.

Some of the relative advantages of straight large tube water-tube boilers are:

Suitability for high-working pressures.—There is practically no limit to the pressure that may be carried in a water-tube boiler. Although Scotch boilers of small diameter have been built for 270 lbs. working pressure, and could be built for even a higher pressure, yet as the diameter, owing to construction facilities, must decrease as the pressure increases, such installations are not suitable for large vessels. A water-tube boiler is usually composed wholly of cylindrical components with spherical or shaped ends and miscellaneous members of such a form as to require no staying, being subject only to internal pressure. The result is a lighter and stronger boiler, capable of withstanding great pressure and rough usage.

Less weight of boiler.—This saving in weight has a most pronounced effect upon the size and displacement of a vessel. If Scotch boilers, with a working pressure of 200 lbs., had been installed on the Great Northern steamships, with the same heating and grate surface as the Niclausse boilers now being fitted, the total increase of weight for the designed 9,000 i.h.p. of propelling engines would aggregate—engines and boilers complete—660 tons. If the draught of water of the vessels—loaded—and speed remained constant, and the same specified total deadweight had to be carried, then the use of Scotch boilers would have increased the displacement about 1,700 tons, an increase of 2.58 times the stated added machinery weight (for 9,000 i.h.p.).

Less volume and weight of water.—An average of ten Scotch marine boiler installations with *160 lbs.* working pressure gives the weight of water equal to *35.6 per cent.* of the total weight of boilers with water. The weight of water in certain Niclausse boilers is *16 per cent.* of the total weight in the large tube boiler and *12.8 per cent.* in the design proposed for the North West, whereas the Babcock & Wilcox boilers have a weight of water equal to *16.8* and *16.1* per cent. of the total weight, respectively. The Belleville boiler contains very little water, the weight of the same being only *8.3* per cent. of the total weight as proposed for the Great Northern Steamships.

Less space occupied and better utilization of space.—Water-tube boilers of the Niclausse and Belleville types, which are cleaned and repaired from the front, can be *arranged in batteries* and thus save much space.

Rapidity with which steam may be safely raised.—With single-ended Scotch boilers, it requires *five to seven hours* to get up steam without dangerously urging the boilers. With large double-ended boilers, usually seven to ten hours are required, but steam can be raised with *water-tube boilers* in *one-half hour* or *even* less, if desired.

Facility with which extensive repairs can be made without disturbing hull of vessel.—Defects in water-tube boilers can almost always be remedied at sea by the vessel's own staff. As the boiler consists of a number of small parts they are easily shipped, handled and erected.

Furnaces of good height with roomy rectangular section above grates instead of a contracted semi-cylinder.—The round furnace of a fire-tube boiler is not a desirable mechanical product, but it is necessary for marine Scotch boilers, on account of the external pressure to be sustained. The water-tube boiler has a grate as wide as the heating surface of the boiler, and as long as the ratio of grate surface to heating surface permits, the length of grate being usually about 6 ft. 6 in. The large flat-sided combustion chambers of a Scotch boiler have a decided cooling effect upon the gases.

Long grates can be used with as great efficiency as small grates.—In Scotch boilers the maximum length of grate is limited on account of diameter of furnace and draught from about 5 ft. to 6 ft. 6 in. In large tube water-tube boilers the length of grate is limited only by the length of the tubes.

Less danger in case of explosion.—Due to less amount of contained water.

Adaptability for working at high rates of combustion.—Scotch boilers are much more liable to injury from forced draught than are water-tube boilers. An increase of 50 per cent. over natural draught combustion, is as great as Scotch boilers can be expected to maintain, and this only with good care and attention. Water-tube boilers of good design can be forced to two or three times their natural draught evaporation without distress, and without endangering or affecting the life of the boiler.

On the other hand the cylindrical fire-tube boilers have certain advantages over the water-tube boiler, and these are enumerated as follows:

Volume of water.—The small amount of water contained in a water-tube boiler has some disadvantages. More care is required to maintain a steady water level and steam pressure. In case of an accident to feed pumps or feed lines there is greater probability of injury to boiler from low water and overheating.

Stopping of tubes without drawing fires.—With a water-tube boiler a defective tube cannot be replaced or plugged without laying up the boiler and allowing it to cool. In fire-tube boilers, a tube can be plugged temporarily without hauling fires or lowering the steam pressure.

Size of boiler units.—It is claimed that it is not practicable to build single water-tube boilers of as great power as single fire-tube shell boilers, therefore a great expense must be incurred when water-tube boilers are used, due to the increased number of boiler-fittings, safety valves, check and stop valves, gages, additional piping, etc. If the decks of a vessel are worked continuously from stem to stern, it is possible that a water-tube boiler of the large tube type would just project through one deck, necessitating the cutting of the same and waste much room overhead. In a case like this, Scotch boilers of very large diameter could be fitted possibly in fewer units than the water-tube boiler, and also utilize the space better, but the advantage of the Scotch boiler is in this case caused by a hull structure that could be modified advantageously to suit water-tube boilers.

Economy.—Experience undoubtedly indicates that the water-tube boiler is not as economical in continuous steaming as the best type of fire-tube boilers. They require skilled attendance, and the man whose only qualification as a fireman is "brute strength" ability to throw coal on the fire, can never obtain from such boilers a good showing at sea. When the water-tube boilers shall have passed through the same process of evolution as the Scotch boiler, we shall have a water-tube steam generator immeasurably superior to the best fire-tube boiler now known, and the great trouble of operating and stoking will probably gradually disappear.

Longevity of boilers and corrosion of tubes.—It has been claimed that on account of the corrosion of the tubes in a water-tube boiler, the longevity of the boiler is not as great as that of a fire-tube boiler. As regards corrosion on the water side, there cannot be much difference between the extent of corrosion of tubes in fire-tube boilers and those in water-tube boilers.

A water-tube boiler steaming with sea water in the feed will require more attention than a Scotch boiler, for on account of the less amount of water carried it will have to be brined or blown off more frequently. The exterior of the tubes of a water-tube boiler has been known to deteriorate on account of the tubes becoming overheated and oxidizing on the outside through contact with the hot gases, but this condition is due to defective circulation, shortness of water, or from the collecting of scale, sediment, grease, etc. At the present time, if the water-tube boiler is given proper attention, no great trouble should be experienced with the corrosion of tubes, and the tubes should last very much longer than the tubes in a Scotch boiler, for they can be cleaned better, and in the case of a boiler like the Niclausse, they can be removed and perfectly cleaned on both the inside and outside. It is a different matter to clean the outside of the Babcock & Wilcox boiler tubes, but it is more difficult to remove the grease and clean the outside of some of the tubes in a Scotch boiler. If the life of the tubes of a water-tube boiler are compared with the steel shell of a Scotch boiler, then the Scotch boiler is vastly superior to the water-tube, but if the drum is compared with shell and tubes with tubes, which is logical, then the water-tube boiler is superior as regards longevity to the Scotch boiler.

Leaking boiler casings.—Non-airtight casings on water-tube boilers is a defect from which the Scotch boiler is quite free. Moreover, the insulation of the casing, supposed to be sufficient to keep the heat within the boiler casing, where it will prove of value, is usually very inefficient. These disagreeable features can, however, all be overcome, and water-tube boilers can be built with airtight, well insulated casings, which would give as good results in both economy and comfort to the operator as is now obtained from a well-covered Scotch boiler.

Feed regulation and restriction to fresh water.—With proper care and attention in an emergency sea water can be used without fear in a water-tube boiler as well as in a fire-tube boiler. In regards to greater regularity of feed being required in the water-tube boiler than in the Scotch, there is no doubt that the water-tube boiler, containing less water, with the same evaporation per pound of coal, will have to be fed more carefully and regularly. A simple automatic feeding arrangement for water-tube boilers is practicable, if such is desired, and with proper care and attention the feeding of a well designed water-tube boiler is simpler than that of any fire-tube boiler.

Dry steam.—It is claimed that Scotch boilers are much superior to water-tube boiler in this question of dryness of steam, but this is not so, for although the Belleville boiler is deficient in this respect, the Babcock & Wilcox and Niclausse boilers are proportioned so as to obtain commercially dry steam.

Boiler efficiency.—It is usually admitted that water-tube boilers show very good efficiency when tested under favorable conditions, but it is asserted that in actual service the Scotch boiler is much superior to any form of water-tube boiler. As this question is discussed elsewhere in this paper, the writer will confine himself here to a statement of facts obtained from boiler tests all made with water-tube and fire-tube boilers under favorable conditions. The British Boiler Committee state that the thermal efficiency of the Scotch boilers on the steamship "Saxonia," fitted with Howden hot air draught and tube-gas retarders, is 83 per cent. when burning 21 ibs. of coal per sq. ft. of grate surface per hour.

Babcock & Wilcox and Niclausse boilers are credited with test efficiencies of over 80 per cent. under very favorable trial conditions with cold air supply. It is quite reasonable to assume, therefore, that water-tube boilers of the Babcock & Wilcox and Niclausse type are, under favorable conditions, as economical and as efficient as Scotch boilers. The Niclausse boilers installed in the Great Northern steamships, with hot air induced draught and a high temperature of feed injection, are expected to show about 80 per cent. efficiency.

Automatic stokers possess features that can undoubtedly make water-tube boilers a success in the mercantile marine, for regularity of fires and uniformity of same are essential requirements for the successful working of this type of boiler, and, as before stated, the class of firemen usually shipped are incapable of getting the efficiency and good results possible with water-tube boilers.

In conclusion the author states that the water-tube boiler is the boiler of the future. An entirely satisfactory water-tube boiler has not as yet been produced, but such boilers as the Babcock & Wilcox and the Niclausse will probably prove the forerunners of a type of boiler that will fulfill the necessary essentials and obtain the confidence of designing and operating engineers. Mechanical stokers and liquid fuel will assist the water-tube boiler in its progress and advance into favor, and although the former will be used extensively in stationary plants, its application to marine work will be somewhat limited, for fuel oil will become very popular afloat and entirely supplant coal in many trades and on many seas.

The Koerting Gas Engine.

An immense impetus to the construction of larger gas engines was given by the comparatively recent discovery that the gases given off by blast furnaces could be utilized in gas engines, and the demand for units of 1,000 horse-power, 2,000 horse-power and upwards, compelled a reconsideration of the design of the gas engine. The four-cycle plan is the one generally adopted for engines of small power, because the same piston and cylinder can be used as a pump for sucking and preparing the charge, and as the power cylinder. Engines of great power, however, become very large and heavy. Hence large engines have usually been built with several cylinders. The result was the so-called "tandem," "twin," and three and four-cylinder engines, but engines of these types are very complicated, and therefore liable to get out of order. In large four-cycle engines the valve boxes also present great difficulties in construction, owing to the immense valves.

Koerting double-acting two-cycle gas engine is double-acting like a steam engine, hence the crank end and the head end of the power cylinder are similar. The admission valves are in the valve boxes, which are bolted to the cylinder heads. There are no exhaust valves required, as the products of combustion escape through slots or ports cast in the middle of the cylinder. These slots are covered by the motor piston, which is made very long and is packed at each end by the customary self-closing spring rings.

The combustible mixture is admitted through two double-acting auxiliary pumps, the one for gas, the other for air. These pumps are so proportioned that their combined action always secures the proper mixture necessary for perfect combustion and introduces the same to the working cylinder. The compression spaces of the pumps are divided, so that the crank ends of the air pump and gas pump discharge into the crank end of the power cylinder, and the head ends of the pumps discharge into the head end of the power cylinder. The pumps compress the gas and air to about 9 lbs. per sq. in.

Referring to the illustration, it will be seen that the piston is at the outer dead point, and that the exhaust ports are exposed toward the opposite or head end of the engine. The instant the piston begins to uncover the exhaust ports, the pressure of the residual products of combustion in the cylinder drops rapidly to that of the atmosphere; when this has taken place, the inlet valve is opened and a fresh charge admitted by the pumps. The valve gear of the pumps is so designed that air only is supplied first, to separate the burnt gases from the succeeding mixture, and afterwards gas and air, mixed in the proper proportions.

The combustible mixture of gas and air is produced only at the inlet to the cylinder. By suitable construction of the admission device, mingling of the air first introduced with the burnt gases, or with the succeeding charge of the combustible mixture, is adequately avoided. For the same reason, loss of mixture through the exhaust ports, which are open during this period, is effectively prevented.

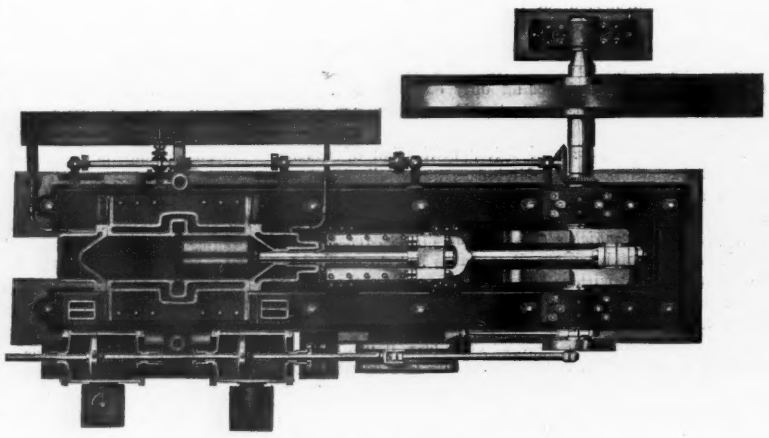
Shortly after the exhaust ports are again covered by the receding piston, the air and gas pump pistons arrive also at their dead point position, and the supply of mixture is interrupted. The inlet valve closes and the charge is compressed in the cylinder, till, at the dead point of the stroke, ignition takes place. The ignited charge expands until the piston uncovers the exhaust ports again and allows the consumed charge to be blown out. On the opposite end of the piston the same operation takes place.

In order to secure the separating layer of air above referred to, between the hot consumed gases and the fresh charge, the gas pump is so constructed that no gas is delivered until after a certain point in its compression stroke. The pump is provided with piston valves with the valve gear so arranged that its maximum capacity cannot exceed 50 to 60 per cent. of its total displacement. For after the pump has completed the suction stroke, the gas suction port is left open during a portion of the succeeding (compression) stroke, so that the gas can return without increase in pressure until the suction port is closed, when the gas is compressed and passed out through the compression port. The amount of gas thus furnished corresponds to the maximum power of the engine.

Regulation of the power is effected as follows: When the load on the engine is reduced, the gas pump begins to furnish gas at a correspondingly later period, thus discharging a diminished quantity of gas into the working cylinder. This is accomplished either by the valve gear of the pump and controlled by the governor, or by a by-pass between each pump end and respective compression channel which leads to the inlet valve on the main cylinder. The throttling device in this by-pass is also under the control of the governor.

It is evident from the above, that the engine operates with a variable amount of mixture, and that correspondingly more or less air is sent first into the power cylinder. This air stays near the middle of the cylinder, while the combustible mixture remains at the heads of the cylinder near the inlet valves and igniters. The peculiar shape of the cylinder heads prevents mingling of the layer of air with the following mixture of gas and air.

For ignition there are two spark coils at each end of the power cylinder. These are operated by a separate shaft, driven by spur gearing from the cam shaft. The gear on the igniter shaft is not fast, but is connected with a sleeve having a feather, which is set spirally around the shaft so that by a sliding movement of the wheel the igniter shaft may be set behind or in advance of the cam shaft. Thus the time of ignition can be changed during running of the engine to suit whatever kind of gas is being used.



The Koerting Gas Engine.

A piston valve is provided for admitting the compressed air for starting at the front and back ends of the cylinder, as in a slide-valve steam engine. This piston valve is operated from the cam shaft by an eccentric, which can be thrown in or out of gear like a clutch. Filling the cylinder with air twice is generally sufficient for starting up.

The power cylinder and piston are cooled by circulating water, which in the case of the piston enters the tube carried through the crosshead pin and hollow piston rod, and returns the same way, but on the outside of the tube. The stuffing boxes in the cylinder heads are surrounded by water. The cylinder walls also are cooled throughout except around the exhaust slots.

The above information has been furnished by the builders, The De La Vergne Refrigerating Machine Co., New York. It is claimed that 41,000 horse-power has been sold in the United States to date.

The Use of Graphite in Air-Brake Triple Valves.

In the December issue of *Graphite*, published by the Joseph Dixon Crucible Co., Jersey City, N. J., are given the results of a number of experiments made by Prof. W. F. M. Goss on the use of graphite in air-brake equipment. The tests were made on the Master Car Builders' air-brake rack at Purdue University, Lafayette, Ind. From the report of Prof. Goss we abstract the following:

The time record, as obtained for each test, shows the valves to have been slower in action with graphite than under normal conditions. For example, the time lapse between the application of the brake on the first car and that of the last car of the 50-car train was 3½ seconds longer when graphite was used than under the usual conditions with vaseline, the facts in this record being as follows:

	Graphite.	Vaseline
Seconds between time of action on first car and time of action on the last car of 25-car train	13.5	12
Seconds between time of action on first car and time of action on the last car of 50-car train	28.5	25

Upon the conclusion of the tests with graphite, as described in the preceding paragraph, the triples were again taken apart. In this process it was discovered that the slide-valve of some of the triples was so firmly held to its seat that it could only be moved by the use of a lever of considerable length. The usual freedom of motion which characterizes several parts of the triple had in many cases quite disappeared. No evidence of damage appeared in any valve, and no surplus graphite was found. Having been thus taken down, the several parts of the triples were well vaselined and having been re-assembled, the triples were restored to their position on the rack.

Following the restoration of the triples, the schedule of tests previously run was in part repeated, whereupon it was found that the action of the triples was more delicate than has ever been shown to be before. The record shows that they were more responsive to skipping tests and the time of action was shorter than in any previous tests made upon them.

The important conclusions of the test may be stated as follows:

1. Graphite alone is not a sufficient lubricant for triple valves.
2. After graphite has been well rubbed into the working surfaces of the valves, and after this process has been followed by thorough oiling with vaseline the action of the triples was more delicate and more rapid than with vaseline alone, prior to the use of graphite.
3. The presence of the graphite on the metal surfaces of the valves, when operated with vaseline as a normal lubricant, serves to improve their action in a marked degree.

Interstate Commerce Commission Income Report for the Year to June 30, 1902.

The Preliminary Report on the income account of railroads in the United States for the year ending June 30, 1902, prepared by the statistician to the Interstate Commerce Commission, contains returns of companies operating 195,945 miles of line, or probably 98 per cent. of the mileage that will be covered in the full report. Passenger earnings were $472,429,165, and freight earnings, $1,200,884,603. Including these and other earnings from operation, gross earnings amounted to $1,711,754,200, or $8,736 per mile of line, and operating expenses to $1,106,137,405, or $5,645 per mile of line, showing net earnings to be $605,616,795, or $3,091 per mile. Net earnings were $51,395,421 greater than during the previous year. The total income of the roads covered by this advance report, including $82,714,492 derived from investments and miscellaneous sources was $688,331,287. Deductions from income aggregated $458,459,961. This amount comprised interest on funded debt, rent of leased lines, betterments charged to income, taxes ($49,426,675), and various minor expenditures.

Dividends on stocks amounted to $150,685,959; the dividends of essentially the same roads were $29,834,690 less in 1901. The surplus from the operations of the roads for which returns are compiled was $79,185,367. The complete report for the year ending June 30, 1901, gave a surplus of $84,764,782.

This report relates to operating roads only, and does not include dividends paid by leased lines from the income they receive as rental. In the year 1901 the dividends of all the railroad companies aggregated $156,735,784, this amount including about $35,000,000 paid by the leased lines.

The McKanna Train-Order Holder.

Mr. Amos McKanna, of Emporia, Kansas, a veteran locomotive engineman of the Atchison, Topeka & Santa Fe, has secured a patent on a hoop, with an attachment carrying a torch, with which to hold a train-order in position to be taken by the engineman or conductor on a moving train. The general appearance of the contrivance is shown in the engraving. As described in the patent specifications the sheet of paper bearing the order is held between the folds of a metal clasp, which is suspended from the lower side of the ring; but the metal clasp has been found unnecessary, and the parts of the ring are twisted together in such a manner that the twist at once completes the ring and tightly grips the paper. The upright staff held in the station man's hand carries two horizontal spring-clips and, at the top, a torch and reflector for making a light at night. The small disk fixed to the top of the ring is a simple piece of bright metal to make the holder easily discernible in the daytime. The torch is placed horizontally and supported by a sleeve which slips on to the upright holder. In the engraving the bright surface of the reflector is all that appears to the observer.

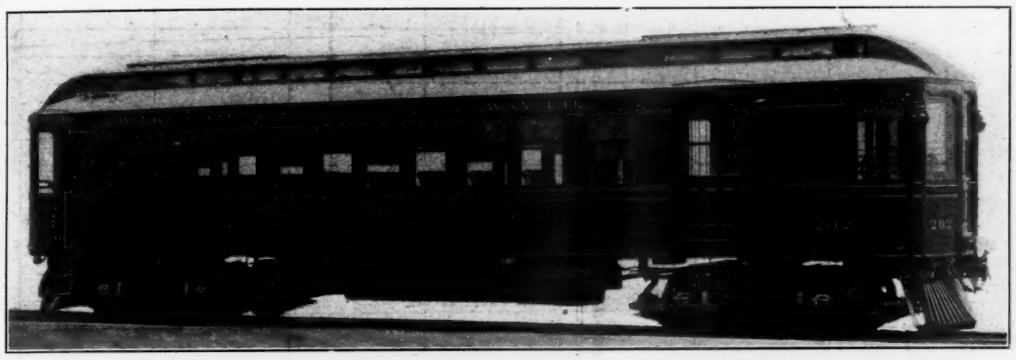
This holder is made by McKanna & Brown, of Emporia, Kansas, and it has been adopted for use throughout the lines of the Atchison, Topeka & Santa Fe. The makers write concerning it: "It is so arranged that where the two disconnected ends of the ring come together, one end overlaps and is twisted around the ring, holding the order tightly. It is easily detached.

"Each engine and caboose should be equipped with a ring, and each station with a ring and staff and torch-

complete. When an order is delivered to a moving train, both the engineer and conductor should throw off a ring, and each receive one from the station man. Thus, each station, engine and caboose will always be equipped with the necessary facilities for delivering and receiving orders. When the train is running slowly, the order can easily be delivered without the use of the staff, by the station man handing up the ring to the engineer and conductor, and receiving their rings in return. When the engineer is notified, by seeing the torch or the daylight signal, of the fact that he is to receive orders at the next station, he should notify the conductor by a certain number of blasts of the whistle. When he has received the order he should give another signal, and the conductor should also signal the engineer when he has received his order."

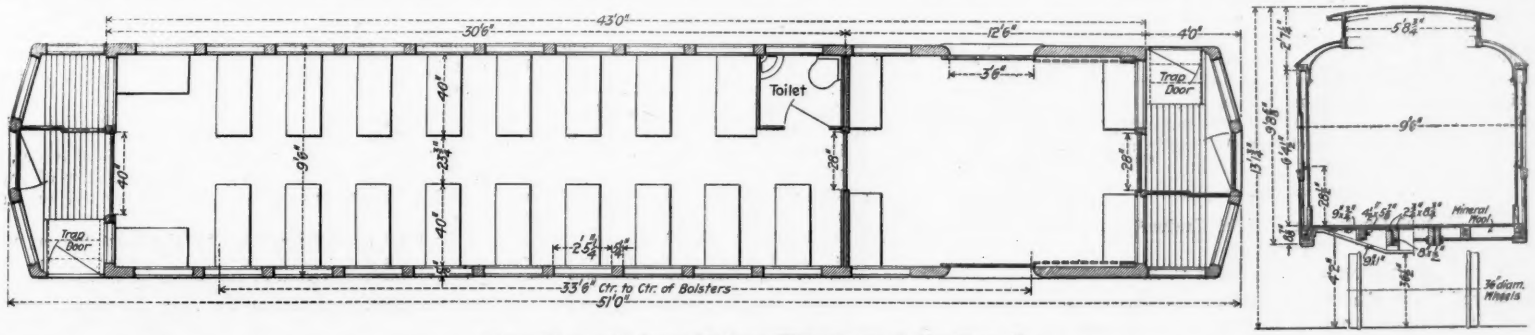
Two High-Speed Electric Cars.

Two cars built to conform to the latest demands of electric interurban service are shown in the accompanying engravings. They were built by the J. G. Brill Company, of Philadelphia, for the Wilkesbarre & Hazleton and the Seattle & Tacoma roads. Both of these lines are operated under similar conditions, approximating steam road practice, each being 40 miles long and having private right-of-way. Outside the cities heavy T rails are used and the system of control is used and the cars may be run either singly or in trains. The total weight of the fully equipped car is 84,000 lbs.



High Speed Electric Car—Wilkesbarre & Hazelton Railway.

The Seattle & Tacoma cars in construction and equipment are generally similar to the Wilkesbarre & Hazleton. They are 41 ft. 6 in. over the crown pieces and 8 ft. 9½ in. wide over sills. The seating capacity is 44, and the weight of the fully equipped car is 60,000 lbs.



Floor Plan and Cross-Section—Wilkesbarre & Hazelton Car.

The general dimensions of the Wilkesbarre & Hazleton cars are shown in the engraving. It will be seen that the length over platforms (51 ft.) and the width of 9 ft. 8½ in. are dimensions almost, if not quite, equal to those of the ordinary passenger coach. The side sills are 5¼ in. x 8⅞ in., reinforced for the overhang by ½ in. x 8 in. plates. The intermediate sills are 4½ x 7¼ in.; the center sills, 6 in. x 8¾ in., double, with ½ in. sandwich plates built in. The body truss rods are 1½ in. in diameter, and these with the double trussed needle-beams are sufficient to counteract the deflection due to the unusually heavy electric controller apparatus hung under the car body. There are two floors to the car, the interspace (5¾ in.) being filled with mineral wool to deaden sound. Ten compound carlines with steel plates ⅝ in. x 1½ in. support the roof.

Double sliding doors are provided at the passenger end of the cars and a single sliding door at the baggage end. The two baggage side doors are 42 in. wide. The motorman's cab in the vestibule has a sliding door opening on the platform and a drop sash in the side and front windows. The upper sashes of the car windows are stationary and are of decorated plate glass, the lower sashes raising.

The car is finished in mahogany with inlaid panels. The headlining is of birch in natural color and decorated in silver. Thirty-eight persons can be seated in the passenger compartment. The cane seats are 40 in. long and have high reversible backs and mahogany arm rests. Four double seats in the baggage compartment are arranged to drop against the sills. A saloon of standard character and fittings occupies a corner of the passenger compartment next the partition.

The trucks are the Brill No. 27 E, with 36 in. steel tired wheels, 6 ft. 6 in. wheel base, 4¼ in. x 8 in. journals and axles 6 in. in diameter, and the weight of each truck, without motors, is 13,000 lbs. The method of building up the truck frames from solid forgings, heavily riveted together with corner brackets, insures strength and rigidity, and the system of equalization with cushioned side swings allows, with safety, high speeds, even when the wheel flanges are shallow on account of the grooved rails over which the cars run in the cities.

An interesting part of the equipment of the car is the brake system, said to be the most complete ever furnished to any form of rolling stock. Each truck is fitted with inside and outside hung brakes, giving 16 brake-shoes on the car. The outside brakes are operated by two methods; the Westinghouse automatic air-brake, for use under ordinary conditions, and a vertical hand wheel in the motorman's cab. The inside brakes are controlled by the Westinghouse magnetic system and a vertical hand wheel in the vestibule. The nature of the line over which the cars run makes it necessary to take every precaution against accident. The grades run as high as 3 per cent. and there are numerous sharp curves. With the fast schedule contemplated it is imperative that there shall be no failure of the brake gear.

The cars are arranged for running in both directions, are equipped with M. C. B. couplers, spring buffers and cow catcher at either end. The Sprague multiple unit

British and American Railroad Methods.

A well-known American mechanical engineer, who has recently been abroad, was much interested in, and closely observed railroad conditions in Great Britain. Being asked by an acquaintance in England to give him his opinion, as a result of his observations, whether or not under existing conditions any improvements could be made that would enable them to handle their business at less cost, he has written a letter on the subject from which we have been permitted to take the following:

"Your roadbeds are certainly very fine, but I noticed two weak points: Your sleepers are put in with 3-ft. centers and should you put heavy equipment on your rails it would be impossible to keep the rail in shape. Our practice gives from 33 to 50 per cent. more bearing surface both for the rail on the sleepers and for the sleepers on the ballast. Your track fixtures, especially the frogs, are what we would consider out of date. Few or no spring frogs seem to be used. Your signaling and interlocking system is good.

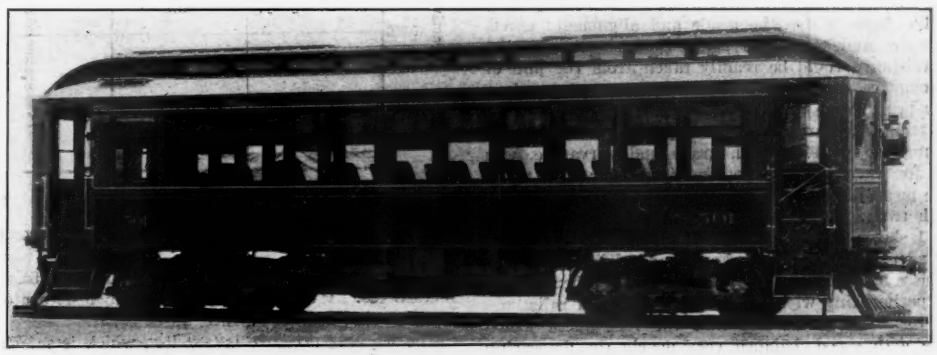
"Beyond the points mentioned the only bad feature I saw in your permanent way is that your overhead crossings and tunnels do not leave room for as large equipment as it seems to me it would pay you to use. This, however, it would be almost impossible to remedy now.

"Your locomotive equipment I found in good shape and doing its work well. Your engines are of less power than those used by our trunk lines; in fact, with the clearances you have under your tunnels and crossings it would perhaps be impossible to build anything like as powerful engines as we generally use; however, under your conditions I think you would not get as great economy from using very heavy engines as we do, owing to your shorter hauls.

"Your passenger equipment, while very much lighter and costing much less to build than that in general use in this country, is doing its work well and is very convenient for the passengers, and has one very good feature; your compartment system, with a separate side door for each compartment, enables a train to unload its passengers very much quicker than we do with our corridor-and-vestibule trains; and with the crowded condition of your tracks this is very important. It seems to me that taking your conditions into account you are working out your passenger business well.

"When it comes to goods traffic there is room for much improvement. In the first place you haul a much larger percentage of tare for each ton of paying freight than is considered good practice with us, and this applies not only when comparing the dead weight of your goods wagons to their capacity but also when comparing your actual average loading to the capacity of the wagons. For instance, the capacity of your wagons is little more than their dead weight; that of the heaviest regular wagons I saw was 10 tons, and their dead weight was eight tons, or the dead weight was eight-tenths of the capacity. With us good practice is one-third of the dead weight to the capacity. We also load our cars very much nearer their capacity than do you. I should judge that it is hardly likely that you could ever use to advantage a very large proportion of the long, heavy goods wagons, or freight cars, that we use here; your conditions would seem to prohibit this; such wagons are used to best advantage for low-class and heavy freight, such as coal and ore. Your business of this class is largely of export and import; your wagons must be either unloaded aboard ship or take their load from the ship and dump it at the terminus. Our large heavy cars would cover the last requirement, but their length and wheel base would prohibit their being handled on your wharves, to dump from wagons into ships, unless your whole handling arrangements at the wharves were entirely changed; this would entail enormous expense, and if ever done it must be a long time ahead. However, I feel sure that it is possible to build a four-wheeled goods wagon which will weigh about 8½ tons and have a capacity of 25 tons. To do this the wagon must have its floor dropped between the wheels much lower than is your present practice, and the whole wagon must be built of steel. I believe that such a wagon can be built within your present limits of wheel-base and total length, width and height; and if it can be done, then your percentage of tare to capacity would be as good as you can get with a long, heavy, eight-wheeled wagon.

"In the meantime, it would seem to me that even with your present equipment much could be done toward loading your wagons nearer their capacity. To do this it would be necessary for your shippers and railroad of-



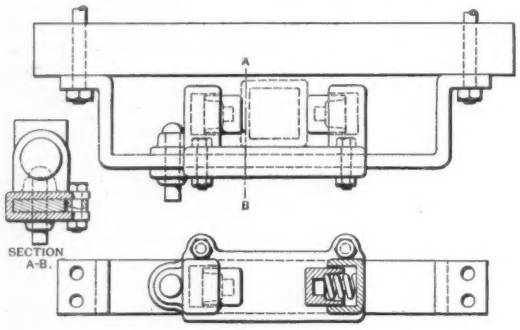
Interurban Car for the Seattle & Tacoma Railway.

ficers to work in harmony. The railroads will have to do a great deal more toward consolidating shipments than is done at present, but when such a system is once organized it would cost the company little more in handling the goods, and if the loading can be made nearer to the capacity it will do much to reduce the cost of handling the traffic.

"There is one other point where it seems to me a big improvement could be made. At the present time the size of your trains is limited to the number of wagons that an engine can stop. Your braking appliances are very crude. If you used a continuous power-brake you could run your goods trains at a greater speed and with greater safety, and run heavier trains; and, what is fully as important, you could safely run more trains on the same rails, all of which would be in the direction of economy."

A Sliding Chafing Iron for Passenger Couplers.

The Washburn Coupler Co., Minneapolis, Minn., has put upon the market the device shown in the accompanying drawing. It is called an automatic slide carrier and is designed for use on passenger cars equipped with the rigid straight stem coupler. It consists of a malleable iron sliding piece fitting over the carry iron with two yielding chafing pieces guiding the coupler stem. A pin fitting in a hole in the slide and carry iron holds the slide



Sliding Chafing Iron for Passenger Cars.

in a central position for all ordinary conditions of service. When it is desired to couple on sidings or curves, the pin is removed and the coupler stem allowed to move freely to a position where the knuckles will engage, instead of blocking over the stem as is necessary when rigid chafing irons are used. When the cars reach a straight track the carrier moves to a central position again, the pin is replaced and the coupler secured in its normal position. The device is simple and strong and easily applied to both old and new equipment.

Virtual Grades for Freight Trains.*

BY A. C. DENNIS, *M. Am. Soc. C. E.*

It is well known that a run at a hill, especially a short one, is a great help toward getting the train over it. The tonnage rating for heavy freights, over probably every road in America, is greater than the load that can be started at certain points. The engineering departments of the railroads know that momentum is of help, but few have attempted to take advantage of it when fixing grades, or have investigated to what limits it could be used.

During the past year more than 3,000 miles were run by the writer with a dynamometer, on heavy freight trains loaded much beyond the rating for the ruling grade, to see what minor grades could be run with momentum, and where the stalling point was on those which could not be run.

The dynamometer record was condensed and plotted on profile paper above the grade and alignment; speed, pull, grade, and curvature being thus shown, so that train resistance could be readily taken from the pull of the locomotive and compensated for change of speed or velocity head, grade and curvature.

The train resistance in pounds per ton, compensated for change in velocity head, grade and curvature, was plotted for very many points and speeds for each train, and the mean of these points taken, as nearly as possible, for each train.

Fig. 1 shows what is believed to be the correct resistance under the conditions shown, and differs radically from the results obtained by Wellington and other authorities experimenting with light trains, cars and rails.

The experiments indicate that the resistances which increase with speed, balance very nearly the decreasing journal friction for trains of box cars of 2,000 tons or more, the tare of which is one-third of the gross weight on a solid frozen roadbed. The resistance for such a train is about 4.7 lbs. per ton for speeds from seven to 35 miles an hour. Warm weather and a less rigid roadbed modify this, somewhat, reducing the resistances at low speed and increasing them at high speed, but the difference is so slight that the 4.7 lbs. has been used as a constant. The resistance due to cold varies from enough to skid the wheels, it is said, to practically nothing after the train has been run enough to get the journals well lubricated and warmed.

The resistances seem to be greater than normal when increasing the speed and less when decreasing, after compensating fully for the change of velocity head. A train increasing its speed from 10 to 20 miles an hour, and maintaining it, would pull appreciably harder than if just reduced to 20 miles an hour from a higher speed. From coasting tests, with the locomotive shut off, it appears that the resistances per ton for the locomotive were about the same as for empty cars, or about 9.0 lbs. per ton.

As train resistances vary with the loading, it was necessary to adopt a common basis, or "rating ton," as the unit for comparing trains. The unit adopted, called the rating ton, is the ton of loading in a box car, or the tare weight reduced to its equivalent in resistance to a ton of load.

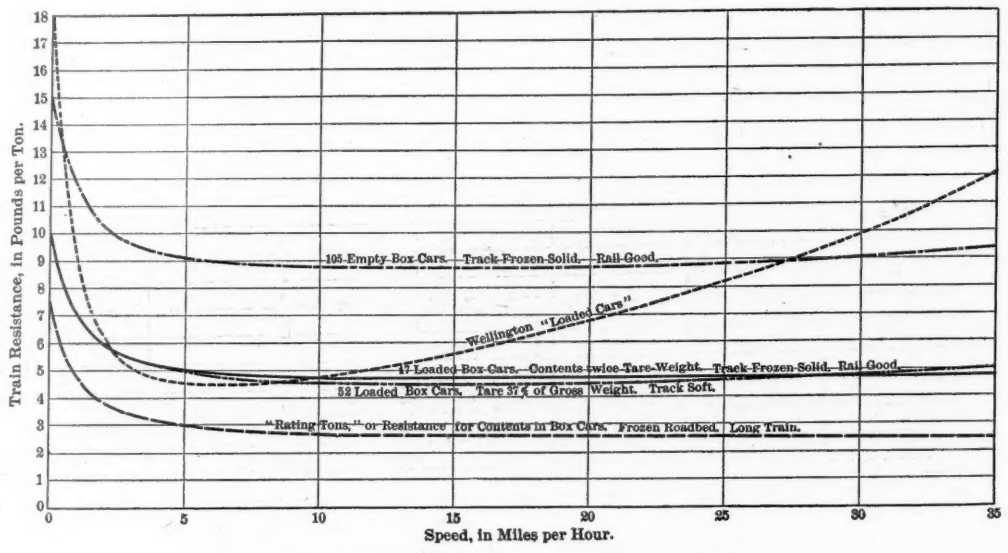

Train Resistance, in Pounds per Ton.
Speed, in Miles per Hour.
105 Empty Box Cars. Track Frozen Solid. Rail Good.
Wellington "Loaded Cars"
47 Loaded Box Cars. Contents twice Tare Weight. Track Frozen Solid. Rail Good.
52 Loaded Box Cars. Tare 37.5 of Gross Weight. Track Soft.
"Rating Tons," or Resistance for Contents in Box Cars. Frozen Roadbed. Long Train.

Fig. 1.—Train Resistance Curves for Heavy Freights.

The train resistance for a rating ton, for speeds from seven to 35 miles, is practically constant at 2.6 lbs. per ton. To reduce tare to rating tons for 0.4 per cent. ruling grade, for example, the following method is used: The train resistance for the rating ton is 2.6 lbs., and the gravity 8.0 lbs.; or, 10.6 lbs. per ton, total resistance. A ton of tare has 9.0 lbs. train and 8.0 lbs. gravity resistance, or 17.0 lbs. total, which is 160 per cent. of the rating ton. Similarly, to change tare into rating tons, multiply by 1.60, 1.51, 1.44, 1.39, 1.34, 1.31 and 1.28 per cent., respectively, for the rating-ton equivalent on 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 and 1.0 per cent. grades.

Fig. 2 shows the actual tractive power at the drivers for a Pittsburgh consolidation compound locomotive. The characteristic dimensions are as follows: Weight on truck, 16,625 lbs.; weight on drivers, 133,400 lbs.; total, 150,025 lbs. Weight of tender, 109,025 lbs.; grate area, 32.25 sq. ft.; heating surface, 1,872 sq. ft.

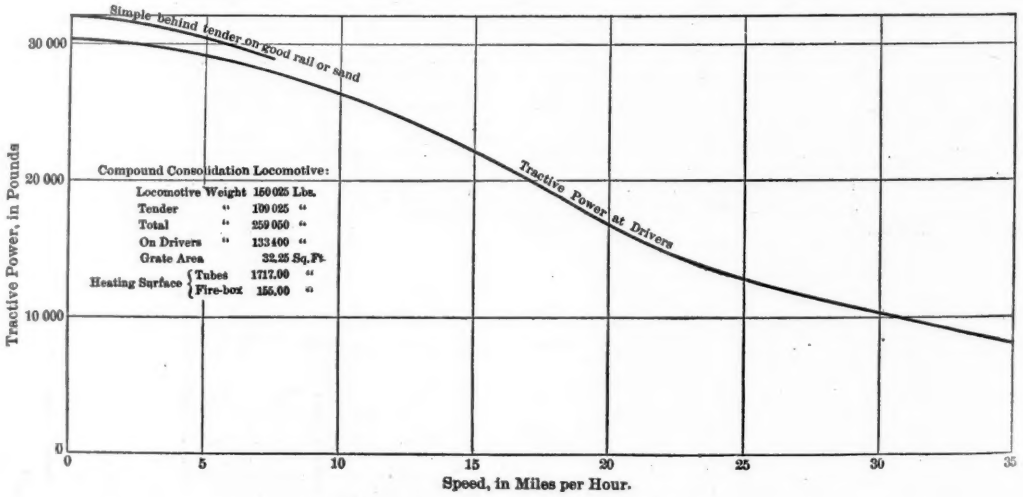

Simple behind tender on good rail or sand
Tractive Power at Drivers
Compound Consolidation Locomotive:
Locomotive Weight 150025 Lbs.
Tender " 109025 "
Total " 259050 "
On Drivers " 133400 "
Grate Area 32.25 Sq. Ft.
Heating Surface Tubes 1717.00 "
Heating Surface Fire-box 155.00 "
Tractive Power, in Pounds
Speed, in Miles per Hour.

Fig. 2.—Locomotive Tractive Power Curve.

The working pressure is 200 lbs., which is sufficient to slip the drivers on good rail, up to eight miles an hour, or higher. The boiler capacity was sufficient to keep a steam supply for all ordinary work. The curve of tractive power was obtained by adding to the dynamometer pull at any point the grade and rolling resistance of the locomotive and tender. The points of trial selected were those where the locomotive should have been working near the maximum, and covered a large range of speeds and many repetitions at the same speed. These results have been plotted, and the curve shown is what is thought to be a fair average. In general, this curve lies about 1,000 lbs. below the irregular maximum.

After the locomotive has been worked to the maximum for about a mile there is a considerable drop in power, due to failing steam pressure, so that the velocity grade curve of the next tenth higher grade (Figs. 3, 4 and 5) will give results more nearly corresponding to the actual performance of the locomotive after passing the first mile when working on a grade in excess of that for which the locomotive is loaded.

The rating for this locomotive, in rating tons at seven miles an hour on a 0.4 per cent. grade, is equal to the tractive power at the drivers for that speed (28,200 lbs.), divided by the resistance per ton (8.0 lbs. gravity + 2.6 lbs. train) $= \frac{28,200}{10.6} = 2,660$ gross tons for the total train. The gross train less the locomotive and tender (130 tons actual × 1.60 per cent. = 208 rating tons) = 2,660 — 208 = 2,452 rating tons behind the tender. For a train loaded with two contents to one tare, for every three tons there are two tons contents, which equals two rating tons, and one ton of tare equals 1.60 rating tons: the equivalent load, then, for the 2,452 rating tons is $\frac{3}{2 + 1.60} \times 2,452 = 2,046$ actual tons behind the tender loaded two contents to one tare. The rating for all tare $= \frac{2,452}{1.60} = 1,529$ tons. The rating for 25 miles an hour on a 0.4 per cent. grade $= \frac{12,750}{10.6} = 1,203$ gross rating tons; and 1,203 gross, less 208 locomotive and tender, = 955 rating tons behind the tender = 803 tons of train loaded with two contents to one tare, or 597 tons all tare.

The tractive power divided by the gross "rating tonnage" gives the pounds per ton of power. From this take the train and gravity resistance, in pounds per ton, and the remainder will be the force for acceleration if plus, and for retardation if minus. This remainder, reduced to its grade equivalent, at 2 lbs., = 0.1 per cent. grade, and divided into the difference in velocity heads for two speeds, will give the distance necessary for that change of speed. The speeds for each change of one mile an hour should be taken separately and the sum taken, if it is desired to calculate the distance accurately.

A table was calculated and curves plotted from it showing the performance of the locomotive on various grades and at various speeds on the basis of the above determined train resistances and engine power: Figs. 3, 4 and 5 for 0.4, 0.5 and 0.6 per cent. grades, respectively.

The distance ordinate for any particular grade rat shows the distance necessary to run from 0 or 30 mile an hour, as the case may be, in order to attain the corresponding speed; and, inversely, the speed attained o lost between two distant ordinates. As an example On the 0.4 per cent. diagram, suppose a start to be made on a level grade 5,000 ft. long, followed by 4,000 ft. of

*Reprinted from the *Proceedings* of the American Society of Civil Engineers, November, 1902.

0.6 per cent. grade, followed by 3,000 ft. of — 0.2 per cent. grade. The speed ordinate corresponding to 5,000 ft. on a level grade is 20 miles an hour; 20 miles an hour on a 0.6 per cent. grade corresponds to a distance of 3,600 ft., being the distance required for speed reduction from 30 to 20 miles an hour; 4,000 ft. more distance on the 0.6 per cent. grade, or 7,600 ft., corresponds to 9½ miles an hour, the speed at the top of the 0.6 per cent. grade; 9½ miles an hour on the — 0.2 per cent. grade corresponds to a distance of 500 ft.; 3,000 ft. more distance on the — 0.2 per cent. grade, or 3,500 ft., corresponds to 21½ miles an hour, the speed at the foot of this — 0.2 per cent. grade.

Some experiments were made with a 10-wheel locomotive of large boiler power and big drivers, with the hope that this type would be better suited to operate momentum grades because of its higher efficiency at high speeds, but the results were rather disappointing, as stops have to be figured on at each station. The 10-wheel locomotive holds speed better, but attains it less readily, and, in general, when running for an adverse grade from rest, reaches the foot of the grade at less speed than the consolidation, but holds it better, stalling at about the same place.

The railroad engineer's almost universal disapproval of momentum grades is probably caused by the lack of an easily-worked method of defining the limits for their proper use, and the mistaken idea that their introduction will cause stalling from bad weather conditions or from the power being in bad condition. These adverse conditions apply with greater force to long ruling grades than to the shorter steeper momentum grades, as adhesion and steaming power are taxed more, or taxed longer, on the former grade, if the momentum grades are not the ruling grades under favorable conditions. In momentum grades part of the work is done by momentum, which is not affected by weather conditions.

Whether or not the engineers who locate railroads figure on momentum, the operating officials take advantage of it to pull what they are able, regardless of the rate of grade. One division which the writer studied had 0.5 per cent. eastbound and 1.0 per cent. westbound grades—these grades being very fairly arranged to balance the heavier eastbound traffic—but because of the length of grade with stops, and uncompensated curvature on the 0.5 per cent. profile grade eastbound, the highest possible rating was that for 0.77 per cent., while, by means of momentum, the shorter 1.0 per cent. grade westbound could be operated with exactly the same rating as the eastbound.

Grades out of a divisional point should be reduced to a somewhat lower grade than at other points, as the first few miles a train is run after standing for some time show a very much higher resistance than the normal, especially in cold weather. The writer knows of one case, in extremely cold weather and high wind, but with pretty clean rails, when it was impossible to start a train out of a level, crooked yard with the locomotive unassisted, but the same locomotive, an hour afterward, handled this train on a 0.4 per cent. grade as usual.

For ordinary stops, at least 0.1 per cent. compensation is advisable, although a compound locomotive can generally start anywhere that it can be run through without losing speed, but at greater risk of broken draft rigging and loss of time, to avoid which generally justifies a slacking of the ruling grade.

On favorable divisions, the rating can be raised 50 per cent. for about 10 per cent. of the original construction cost by the proper introduction of momentum grades, and, incidentally, the rise and fall and curvature be improved. These improvements may often postpone indefinitely the necessity for double track, and are in line with, as well as being a preliminary to, double-tracking. Because of fewer stops, momentum grades generally tax locomotive powers less on double-track lines.

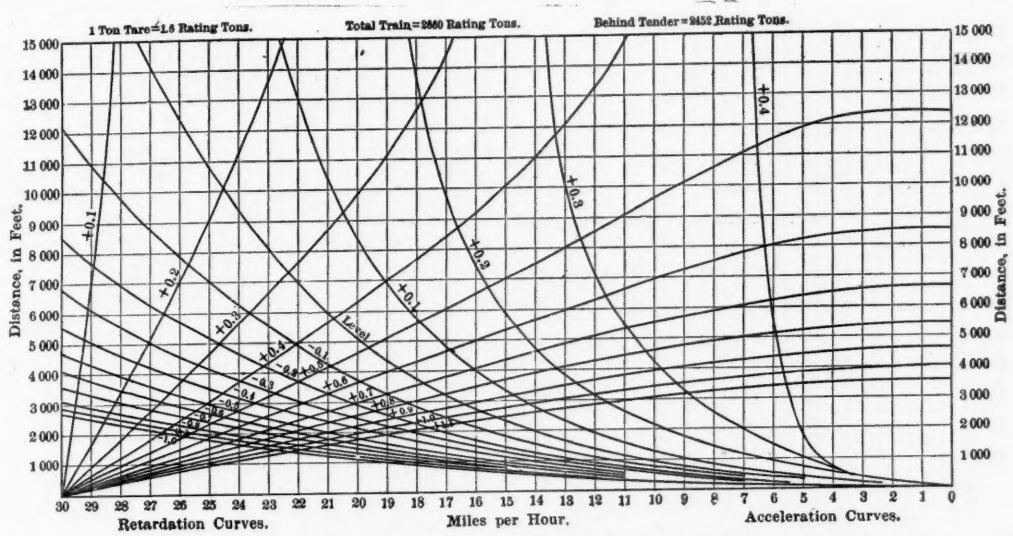


Fig. 3.—Distances for Various Changes in Velocity for Consolidation Locomotive Working Compound and Hauling Full Rating for 0.4 Per Cent. Grade, Compensated.

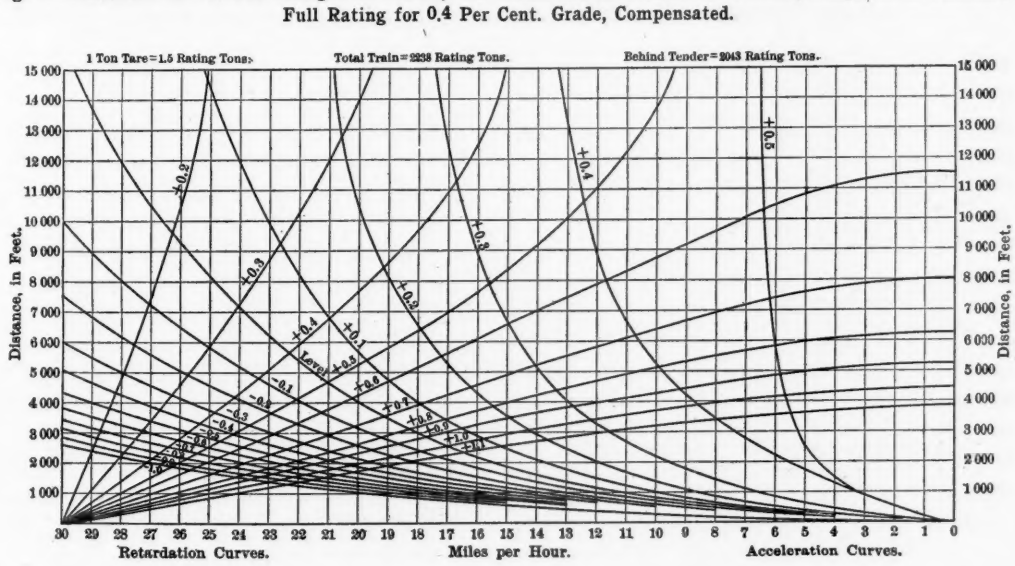


Fig. 4.—Distances for Various Changes in Velocity for Consolidation Locomotive Working Compound and Hauling Full Rating for 0.5 Per Cent. Grade, Compensated.

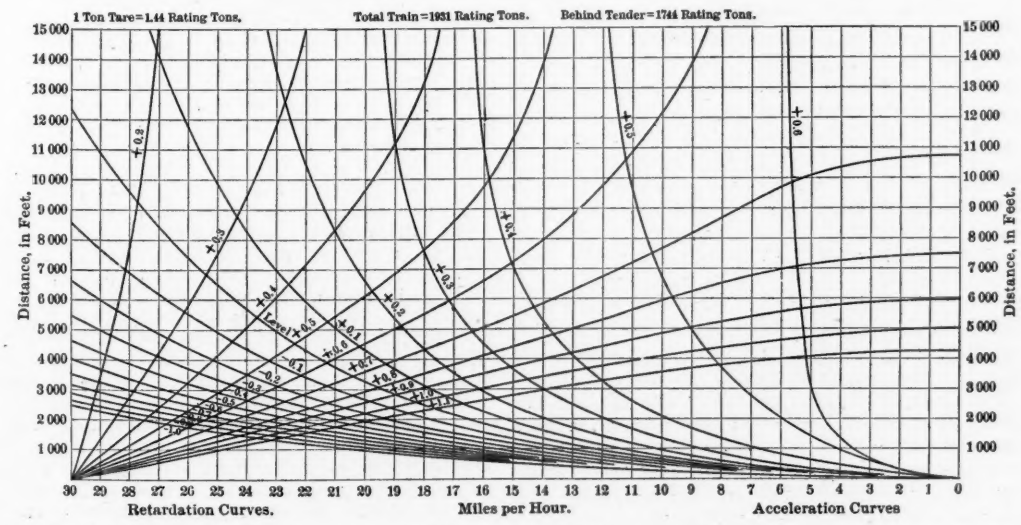


Fig. 5.—Distances for Various Changes in Velocity for Consolidation Locomotive Working Compound and Hauling Full Rating for 0.6 Per Cent. Grade, Compensated.

Records of the Life of Cross-ties.

The President of the American Railway Engineering and Maintenance-of-Way Association, Mr. Kittredge, has sent the following letter to managers of American railroads:

The attention of the managements of American railroads is invited to the system of marking cross-ties, advocated in the report of the Committee on Ties, submitted at the third annual convention of the American Railway Engineering and Maintenance-of-Way Association.

The plan proposed is similar to that adopted by the U. S. Department of Agriculture in a section of experimental track laid in the State of Texas, and briefly described is as follows: Each tie is marked with a dating nail; this is placed between the rails on top of the tie, generally at a specified distance from the rail. They are of steel, covered with zinc or tin, and have the year stamped in the head. When renewals take place, the date at which each tie was laid is noted, and in this way an absolutely reliable record is obtained. The nails cost very little (about 6 cents per pound —30 nails), and when put in by the section gang, the labor is very slight. Several American railroads have already adopted this plan, and it is to be hoped that the practice will eventually become general.

Accurate statistical information in regard to the life of treated and untreated ties, a comparison of the different kinds of wood used for cross-ties under varying conditions of soil and climate, etc., is essential to the proper study of the tie question. For the purpose of making data of this character available and presenting it from year to year, series of blank forms had been prepared by the Committee on Ties, which have been adopted by the Association as standard, and it is suggested that each road take the necessary steps to at once inaugurate the system of keeping tie records in the manner proposed by the Committee.

The value of an accurate record of the life of ties cannot be overestimated, for it is the only way in which reliable conclusions can be drawn. It is to be hoped that all roads will appreciate the importance to themselves and to others of keeping up this information.

Samples of the blanks above referred to will be gladly furnished by the Secretary of the Association, 1562 Monadnock Block, Chicago, Ill., on application.

A Boiler Explosion in Chicago.

A disastrous boiler explosion occurred at the plant of Swift & Co., in Chicago, on Saturday morning, Nov. 30, which resulted in loss of life and considerable property damage. The accident occurred in the refrigerating plant, which contained a battery of 11 boilers arranged in two sets of five and six units respectively, the set of five being on the north side of the room and the other set opposite, or on the south side of the room, with a space of 25 ft. between. The primary explosion was in the middle boiler in the north battery and the remaining units of the battery were blown from their foundations. The opposite battery had the fronts carried away and one of this set was carried off of its foundation.

The building enclosing the boilers, which was a one-story brick structure, was practically demolished, the bricks being scattered over a considerable territory and doing much damage. One boiler was blown 30 ft. in the air, passed over an adjacent building and tore out a part of the further wall of the latter in its fall. A second was blown to the north a considerable distance, but did no great damage. A third went eastward through the wall of the boiler room and killed two men as it fell.

Thirteen people were killed outright or died within a short time, and 26 were more or less seriously injured.

At this writing the cause of the explosion has not been determined. The records of the boiler inspection department of the City show that the boilers were inspected in June and were pronounced in good condition. They were tubular boilers, 60 in. diameter by 16 ft. long, with thickness of shell $^{7}/_{16}$ in., and of head $^{9}/_{16}$ in. They were made in 1900, had been tested to 180 lbs. by hydrostatic pressure and were only permitted to carry a working pressure of 120 lbs.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

Some of the newspapers suggest that the Colombian Government has a scheme for selling the Panama canal rights to a private company, or to some nation other than the United States. It does not seem as if anybody need to be worried about this. The field was canvassed thoroughly long ago by the Nicaragua people, and it is even less probable now than it was in years past that any private company, or any nation, would seriously think of building a Panama canal in face of the probability that the United States would ultimately build a Nicaragua canal, or vice versa. We have long thought that the best possible solution would be to turn this whole matter over to a private company, the neutrality of the canal being guaranteed by the great powers, and perhaps that may be done even yet.

Newspaper despatches tell us that the General Manager of the Chicago, Burlington & Quincy says that his company has informed all of its trainmen and express messengers that a dead train robber is worth $1,000 to any of them. We have not tried to get confirmation of this, because we are obliged to ask so many questions that we do not like to ask unnecessary ones and, because we want to assume that it is true. If it is not true, it ought to be. Everybody can see certain objections to the broad policy. The trainmen might not be so discriminating as a man with hypercritical notions of justice would demand; but it is well to encourage the feeling which the old Scotch judge had towards a couple of vagabonds who were brought before him. He settled the case by suggesting to them that they would be all the better for a bit hangin'. There are some thousands of people in the United States who would be the better for a bit shootin', and the peaceful citizen who wants to journey over the country and mind his own business and feel safe from molestation and robbery will not inquire too carefully into the pedigree of any dead train robber whom the C., B. & Q. men happen to bring in. Unofficial citizens and municipal and county officers have a lethargy in the matter of tramps and train robbers which it might be well to disturb even if the law were strained.

Sunday, November 30, appears to have been as busy a day in the freight yards in and around Pittsburgh as was the preceding Sunday, and an enormous quantity of freight was moved. The press despatches say that the congestion of cars was so much relieved as to put most of the lines nearly in their normal condition. The managements of the Pennsylvania, the lines east of Pittsburgh, and those west, have established a "Terminal Board," which will exercise direct control of all the stations, tracks and yards in and around Pittsburgh. The Chairman of this Board will be Mr. R. M. Patterson, General Superintendent of Terminals, who already acts under the joint authority of the managements of the two systems, the eastern and western. This incident illustrates anew how commerce constantly strives to disregard artificial barriers. One of the hardest things in the world, because so contrary to fundamental economic laws, is to maintain a custom house where there is no natural wall of separation. Equally subject to constant annoyance is a separation of railroad operations where there is no separation of ownership or geography. This simplification of management at Pittsburgh is not an innovation, for freight engines and crews have for many months been run through from points east of Pittsburgh to points west, and vice versa, not to mention numerous other things in which the two administrations (as the Germans would call them) have economized by co-operating. The establishment of a Board would seem to indicate that the General Superintendent of Terminals finds a special need for frequent conferences with the division superintendents on either side of him; but with such intricate problems as now present themselves at Pittsburgh this procedure would undoubtedly be very desirable, if not absolutely necessary, even were the three operating companies absolutely consolidated.

Live Stock and Other Rates in the West.

Mr. A. C. Bird, Third Vice-President of the Chicago, Milwaukee & St. Paul, has done a public service by drawing attention to certain elements in rate-making which usually receive little notice from editors and Congressmen. He says that there is practically no scientific basis of rate-making, for prices always, during the past 25 years, have had to be made under stress of competition; competition, comparison and compromise are the only scientific "data" that are usable. Asked to show the reasonableness of certain rates on his own road, he explained that they are now too low, by comparison and considering all the conditions. To those State railroad commissioners—particularly those of certain large Southern States—who hold conventions, and devote a good share of their time between conventions, for the purpose of demonstrating what scientific rates are, this must be a shock; it is what soldiers call the offensive defensive, which we are taught is the only defense which wins. Everybody sees, when the facts are actually looked into, that Mr. Bird is right. Competition compels compromise, even at remote points which seemingly are non-competitive. Competition is so all-pervasive that there is very little middle ground between free competition on the one hand, and arbitrary State-made rates on the other; and if the authorities, of Texas for example, are going to try to make rates scientifically, their only feasible course is to build a high wall and totally exclude competition. Unfortunately for the Texas theory, the power of the Federal government over interstate rates comes in to spoil any scheme of that kind.

The Chicago hearing at which this matter came out (reported in brief Nov. 14, page 872) had to do chiefly with rates on cattle to Chicago, but Mr. Bird took occasion to point out that all of the rates of his road were low when compared with those of other companies which carry several times as much freight per mile of road. For instance, the St. Paul, in 1900, had 550,000 ton-miles per mile of road; whereas the large trunk lines of the East had six or seven times as much. It was not claimed that the Pennsylvania, for example, ought to carry freight for one-seventh, or any other small fraction of the prices prevailing on the St. Paul, but the difference in density of traffic was brought into view, as it should be. The fact is that the strife to rapidly settle new territory in the West, which has produced railroad competition as severe as any that ever was seen between parallel lines with common termini, has made the people in that region familiar with tariffs which are really very low when measured by the true factor which is applicable to the situation, the factor based on the worth of the service rendered *and* the cost of rendering it. Being familiar with low tariffs, they come to assume that they are reasonable tariffs. It is somewhat dangerous even to mention cost of service as an element in rate-making; for any American legislator will in five minutes show you that every railroad in the country is making a large profit on the cost of its property, and will tell you that it ought not to earn profits on water; but we will not stop to argue that very old point now.

What we want to say is that Mr. Bird is probably right when he says that his rates are by comparison too low. The St. Paul's net income has lately been large but its maintenance and improvement expenses are also large, and must be so if the people of the Northwest are to be well served in the lean years. If the St. Paul road or any other large company in that region were to earn much more net money than it now earns it is practically certain that an important part of that increased income would go right back into the property as additional insurance of the capacity to give good service and low rates when the people most need low rates, viz., when the times are hard and tonnage falls off. The immense expenditures now going on in track elevation, track, structures and equipment are just as much for the people as for the owners of the railroad securities; it is part of the accumulated assets of the country against hard times.

Coming down to specific rates, the railroad men who appeared before the commission at Chicago seem to have had no trouble in showing that the live stock traffic was the most unfortunate example that could have been found in the whole list for showing that rates were too high. It was shown that for cattle, the freight rates in a certain period taken were equal to 2.6 per cent. of the value of the cattle; whereas for lumber for the same distance they were 23 per cent.; for salt 51 per cent. and for coal 92 per cent. of the value of the goods.

Mr. Stickney, of the Chicago Great Western, charged the complainants, the Live Stock Commission men at the Union Stock Yards, with the possession of what he called "gall" in making the complaint, considering their own charges for commissions. In many cases, apparently in most, the charge for yardage, feed and commission is more than the railroads get for a haul of 50 miles. On certain hauls of 100 miles cattle paid $18.05 and then paid $16.25 for yardage, feed and commission; hogs, transportation, $19.50; yardage, etc., $12.35. These figures may not prove anything new, for everybody knows that American railroad transportation is one of the cheapest commodities that has been produced by civilization. But the comparison must have been effective.

Of course, the essential grievance of the cattle men—that the other cattle men in Kansas City get the better of them, because the railroads take dressed beef eastward from the Missouri River at low rates—will have to be settled, if settled at all, by the very method named by Mr. Bird—compromises. The theory that as cattle are the "raw material" from which the packers make other material to be sent in refrigerator cars, therefore they come under the rule that the farther back you go toward the elements that make up any manufactured product, the lower must the freight rate be—this theory is interesting as a theory, but otherwise is, in this case, good for nothing at all. On the face of the matter it would seem as though a steer could be carried cheaper after he is "skun out" and cut up, than while he is in his native bulky and rampant condition. If a railroad has carried dressed beef cheaper than it has carried the live animals it is generally because somebody has held a pistol to its head.

Annual Reports.

Chicago & Eastern Illinois.—The report of this company for the year ending June 30, 1902, was issued nearly two months ago, but it is not too late to call attention to it because, although the road is not of first importance in miles worked or in amount earned, it is peculiar in train load and in rates received. In the year under review the average freight train load was 629.1 tons. The increase from the year before was 116.6 tons, or 22.75 per cent. Especial attention is called to the fact that the total engine mileage is used in computing the train miles. The ton-miles hauled increased 19.56 per cent., the total having been 1,097 millions, and yet, the freight train-miles decreased 3.7 per cent. The average rate received per ton-mile was 4.59 mills as against 4.93 mills in 1901. Notwithstanding this serious drop in the average rate received the receipts per freight train-mile increased 15.73 per cent. This year the average freight train-mile receipts were $2.78, the year before $2.40. Obviously, the heavy train load much more than made up for the fall in the average rate.

The earnings from freight traffic increased 11.4 per cent., and all of the gross earnings increased 10.92 per cent. Operating expenses increased 6.79 per cent. and operating expenses and taxes increased 6.28 per cent. The final result of operations was an increase in the net receipts from traffic of 17.81 per cent.

In absolute figures, on 738 miles worked, the company earned $6,277,494 gross and $2,577,761 net. The fixed charges were $1,378,026. Six per cent. was paid on preferred stock and also 6 per cent. on the common, and a balance was left of $607,172. All of this balance was appropriated to new construction and permanent betterments, to new coal cars and to depreciation of equipment. Altogether, this tidy property must have had good management as well as good luck. Of course, the reader is aware of the fact that the road is a great carrier of soft coal from the Illinois and Indiana fields into Chi-

cago. No commodity table is given so that we cannot ascertain what part of the freight traffic was derived from coal.

In the message of President Roosevelt which was sent to Congress this week there is a paragraph favoring the amendment of the safety appliance law in the direction which was proposed in the last Congress, when a bill was passed by the Senate but no action was taken in the House. The changes which are under consideration, and which were dealt with in the bill that the Senate passed, extend the provisions of the automatic coupler law and the grab iron law to locomotives, tenders, cabooses, snow plows, etc.; and contemplate the gradual extension of the power-brake law so as to require the use of power-brakes on a larger percentage of cars in freight trains than is now customary on some roads, the intent being to ultimately require all of the cars in a train to be air-braked and the air-brakes used. It is proposed also to put railroads in the District of Columbia and in the Territories under the operation of the law.

NEW PUBLICATIONS.

The Historic Highways of America. Volume 1, Paths of the Mound-Building Indians and Great Game Animals. By Archer Butler Hulbert. Maps and illustrations. Crown 8vo, cloth, uncut gilt top. Pp. 140. Cleveland, Ohio: The Arthur H. Clark Company. 1902. $2.

It is proposed to publish in a series of 16 volumes (the 16th being an index to the set) a pretty thorough historical and philosophical study of the great highways of our country. Underneath the scheme lie certain well-conceived ideas. It is assumed that the earliest roads were not on arbitrary lines, or laid down by chance; but that they were determined by topography and climate. Then the social and political geography of the nation that grew up was greatly determined by these early roads. At least the conditions that fixed the first great lines of travel also fixed the later movement and distribution of population. It is easy to see how interesting might be the study of early roads if undertaken in the light of these principles. But such studies must have peculiar interest in our own country, with its variety of topographical features, many of them colossal in size; with its range of climate and with its vast distances. Moreover we are only eight or nine generations removed from the beginning of the opening of our continent; the early landmarks remain still, and the traditions are yet fresh. And, still further, men now living and in vigorous manhood were pioneers and, themselves, followed game trails into the wilderness where cities now stand.

The fundamental conditions which fixed the main lines of travel governed the first Indians of whom we have any record, and also the great game animals, particularly the bison which moved in immense herds along the lines of least resistance, along the water-sheds and through the low passes. Mr. Hulbert says that "the three great overland routes from the Atlantic seaboard into the central west were undoubtedly first opened by the buffalo; one was the course through central New York followed afterward by the Erie Canal. . . . The second from the Potomac, through southwestern Pennsylvania to the headwaters of the Ohio; the third the famous route through Cumberland Gap into Kentucky."

With such ideas in mind it was logical that the first volume of the series should deal with the topography and geography of the remains left by the mound-building Indians and of the buffalo trails. The volumes to follow are: Indian Thoroughfares; Washington's Road: The First Chapter of the Old French War; Braddock's Road; The Old Glade (Forbes's) Road; Boone's Wilderness Road; Portage Paths: The Keys of the Continent; Military Roads of the Mississippi Basin; Historic Waterways; The Cumberland Road; Pioneer Roads of America, two volumes; The Great American Canals, two volumes; The Future of Road-Making in America, and Index. The first volume was published September, 1902, and a volume will be issued every two months until completion.

The Trans-Siberian Route.—Notes of a Journey from Pekin to New York in 1902. By Clarence Cary. Pamphlet, 54 pages and map. 50 cents.

Mr. Cary's pamphlet is a record of a journey which he took recently over the Trans-Siberian Railroad. It is not only interesting, but it is important, as it tells what may be seen by an intelligent and careful observer of ample experience in Asiatic travel and in railroad affairs, and with the best possible official introductions. It is more compact and up-to-date than anything now obtainable concerning this important route, which is, in fact, but little known, and hardly yet opened to the public.

What Mr. Cary's experience indicates as to the advantages of foreign languages, and the necessity of American youths being better trained therein, for the furtherance of our American trade interests should be carefully considered by parents and teachers, as well as business men generally. Copies may be obtained from the *Evening Post* Job Printing House, 156 Fulton street, New York.

The American Society for Testing Materials. This society has just issued a pamphlet containing charter, by-laws, rules, officers, list of members, etc. Besides this, it contains general information concerning the International Association for Testing Materials, the proceedings of the fifth annual meeting, the annual report of the executive committee, and a list of contents of previous publications. There are many of our readers who should be interested in this society and should take membership in it who have but vague notions of its character and work, and for them this pamphlet will be of particular use. The society devotes itself exclusively to the standardization of specifications and to the study of the properties of the materials of engineering and the methods of testing. It is in direct organic relation with the International Association for Testing Materials, and is accomplishing a great deal in the work for which it was organized, which, of course, is of importance not only to engineers but to manufacturers. Individuals, corporations and technical societies are admitted to membership, and the annual dues of each member are but $3. The pamphlet and any further information can be had of the Secretary, Prof. Edgar Marburg, University of Pennsylvania, Philadelphia, Pa. The President of the Society now is Dr. C. B. Dudley, and the total membership is 232.

Metallurgical Laboratory Notes. By Henry M. Howe, Professor of Metallurgy in Columbia University. Octavo, 140 pages, illustrations, index. Boston: The Boston Testing Laboratories. 1902.

Professor Howe in his preface explains that he has tried to work out a system of analytical metallurgy with the aim of teaching underlying principles by a series of distinct experiments, each experiment testing directly one or more of these principles. His criticism of the established methods of laboratory instruction is that applied metallurgy is taught and processes are learned rather than principles. He has aimed to clear away needless difficulties in methods which would simply waste the student's time and so the better to concentrate attention on the special principle which each experiment illustrates. While it is argued that it is of direct use for a student to learn details of practice, Dr. Howe reasons that these are learned inevitably, easily and accurately in the practice itself, but are only learned with difficulty and distortion in the school laboratory. On the other hand, it is here that principles are most readily and perfectly learned; therefore, we are following the path of least resistance if we study principles in the laboratory and details of practice in practice itself. By way of working out this scheme 91 experiments have been devised, and these are explained at greater or less length as may be required, in this little volume. These are arranged in six different groups. One group deals with pyrometry and calorimetry, another with the melting points of silicates, etc., others with refractory materials, with iron and steel and with non-ferrous metals. An appendix gives directions for lining crucibles, and another one gives half a dozen necessary tables.

TRADE CATALOGUES.

The November number of *Ryerson's Monthly Journal and Stock List* is an anniversary number commemorating the 60th birthday of the house. There are 24 pages of historical matter in which the founding and growth of the house are reviewed, illustrations of the various stores and warehouses occupied at different times being given. There are also given a number of letters from old-timers who had early dealings with the house, and whose reminiscences give a good idea of the conditions existing in the boiler-making business 40 or 50 years ago. The Ryerson family have been associated with the iron and steel business in America practically since its inception, as the following quotation from the *Journal and Stock List* will show: "The records of the family go to show that one George Ryerson, in 1695, together with two or three other men of that time, purchased from the Indians 6,000 acres of land in northern New Jersey, which they developed for its agricultural and mineral resources. His son, Martin Ryerson, pushed the development of the iron interests to the extent of manufacturing pig iron as early as 1740. His son, Thomas Ryerson, started in business as a wholesale dealer in finished iron and steel products in Philadelphia in 1790. His son, Joseph T. Ryerson, came out to Chicago and established the present firm of Joseph T. Ryerson & Son in 1842. His son, Edward L. Ryerson, continued the business, which since the year 1888 has been a corporation, of which he has been president. His son, Joseph T. Ryerson, enters the employment of the firm on this 60th anniversary of its founding, thus making the sixth generation in the line of descent associated with interests of this character."

I-Beam Trolleys.—Pawling & Harnischfeger, of Milwaukee, Wis., send us a bulletin, just issued, devoted to standard I-beam trolleys which are a part of their large line of cranes and carrying apparatus. These trolleys are intended to run on the lower flanges of regular I-beams. The frames are of cast steel and the axles have roller bearings. These trolleys are made in capacities of from ½ ton up to 10 tons. Special types are made to run on the upper flanges of a double I-beam bridge and are made in sizes up to 20 tons.

The Rodger Ballast Car Co., Chicago, has issued a handsome large catalogue describing the features of the Rodger ballast car and the Hart convertible cars. Numerous diagrams and photographs serve to show the operation and construction of these two types of rolling stock. They are called multi-service cars because of their adaptability to various conditions of freight service, being used for ballast, coal, or any other bulk lading. The arrangement of the hopper doors and aprons is such that almost any desired distribution of the lading may be obtained, either over the right of way when ballasting or over unloading bins and chutes.

Railroads and Their Relations to Municipalities.

On the evening of Nov. 25 a great celebration took place in Pittsburgh. It was conducted by the Chamber of Commerce and was to commemorate the anniversary of the day, now 144 years ago, when Fort Duquesne was taken by the army under General John Forbes, with the aid of Colonel George Washington. The first address of the evening, and the one in which our readers will find especial interest, was made by Mr. L. F. Loree, President of the Baltimore & Ohio Railroad. We give it below entire, as reported by the *Pittsburgh Post*, with a few verbal corrections.

As a resident of this neighborhood for over six years, and as one having almost daily to do with some parts of your affairs, I hold myself to be part and parcel with you. Doing business in New York, Philadelphia, Baltimore and Washington, in Cincinnati, Louisville, St. Louis and Chicago, in Cleveland and Pittsburgh, I have watched with great solicitude your position in the race for municipal supremacy. If you judge by the tone of your public press, if you ask the man in the street, I take it you would be warranted in thinking yourself in the flood tide of prosperity, with an assured future. To me you seem to have arrived at the critical stage in your affairs. I came here feeling that your future really depended upon the wisdom with which you treated two subjects of prime importance—first, your credit, and second, your transportation.

I have been very much relieved to find that the information I gathered from your press as to the condition of your credit was not justified by the facts. I had supposed that, with a return for taxation of $305,000,000, with a limitation on your borrowing of 7 per cent. on that amount, with a public debt of $21,000,000, your credit was exhausted. I find, however, that you are entitled to set off against that debt the $6,000,000 that you have in your sinking fund, and that you still have financial resources.

A municipality or corporation that has exhausted its borrowing power, though it has not been reduced, perhaps, to the unfortunate position of a bankrupt, still has definitely fixed limitation to its growth. It is a great relief to me to find that no such limitation is upon you, and to know that for the responsibility of the future you have resources upon which to draw.

Your means of transportation consist, I take it, of the waterways, the highways and the railroads. When I say waterways I do not have in mind the blue water or the Great Lakes, but the rivers and creeks, the bayous and lagoons and canals upon which not one in 10,000 of you ever ride or ship a ton of freight, but whose clamor fills the mighty heavens. They are idle for months in the winter because they are tender plants that will not stand exposure to the weather; and they are idle for months in the summer, I once thought because they shrank away modestly into retirement, but lately I have come to believe, because, their deeds being evil, they cannot stand exposure to the sun. They have about them, however, all the charm of novelty and all the fascination of the unknown.

On the other side, where the people who are responsible for the conduct of public affairs preside over both the waterways and the railroads, they treat their waterways as with some definite purpose. I was rather surprised, being in Rotterdam summer before last, to find the River Meuse, the principal arm of the Rhine, upon which enormous navigation takes place, a seaport doing business with all parts of the world, traversed by a Government railroad with a drawbridge, and that the Government only opened the drawbridge for the movement of vessels between the hours of 10 and 11 in the morning and 3 and 4 in the afternoon. I seldom go to New York but that the drawbridge over the Passaic river is open and a trainload of 300 people kept there 10 minutes while a fishing smack, with a man and a boy and a bushel of oysters, slowly sails through.

A suggestion has recently been made, and alluded to by your chairman, of the raising of the bridges over the Allegheny river from their present height of 35 ft. above pool level to a height of 50 ft., while the Union bridge, at the Point, it is suggested, should be raised to a height of 70 ft. Now, I have made some pictures, and I went down on Sixth street and drew chalk marks on the buildings to see just what that would mean. And the disfigurement you would suffer under those circumstances so appalled me that I have not been able to give a rational consideration to the subject since.

I am not one of those who take an extreme view of the navigation question. I would be perfectly willing to support a measure in the river and harbor bill that would provide an annual appropriation of $3,000,000 to secure a nine-foot riverway from here to Cairo, but I could not bring myself to support a measure to provide navigation in a rivulet in Idaho that the engineer reported could only be kept supplied with water by a proper system of artesian wells.

I have always supposed that I could live in a community where the other fellow lived, if they treat me the same way they treat themselves, and I have no objection to the improvement of the navigation of the Allegheny river, if it is not done at the expense of the destruction of your highway traffic and your railroad traffic. What seems to me to be up to these gentlemen of the river is to improve their methods. They are doing business on the old basis of 60 years ago. The rest of us have built large locomotives and automobiles and other improvements in transportation, but they have got the old stern-wheelers with the high stack. Why, I understand that about five days in the year the river gets so high they can't go under the bridges, but I was astonished to find that during those five days the current was so swift that if the bridges were not there they could not navigate anyway.

One of the startling discoveries of biology is that in the life of the embryo are reproduced the various stages in the evolution of the species. So I have often fancied civilization still retains the evidences of its evolution through barbarianism from savagery. In the Sandwich Islands we find the institution of taber and in China progress is impeded by the sacred character given their graves. So here the highway seems our sacred institution, to touch which is like laying one's hand in the ark of the covenant; punishable with death.

When I go up against the question of improving the railroad and find that I am in contact with a highway, I am always reminded of the comparison to my instruction as a youth in grammar. They used to say it was "bad, worse, worst." If one of your manufacturers orders a car from a railroad for shipment he wants it yesterday. If he doesn't get it when he wants it, he says we bungle the business. If we come here and order a locomotive, we cannot get it for 12 months. We are told that as an evidence of business prosperity. If it is necessary in the development of a railroad to make some changes in the streets—well, then, I am reminded of the experience of the poet in his effort at reform. He says:

"If you would all things set right
Nor ever man offend,
You may begin your work to-night—
But God knows when you'll end."

The highways do keep up with the march of progress. We are getting better pavements, we are getting the wires under ground, we have invented the bicycle, and they tell me that at St. Louis, the other day, France asked for 36,000 square feet of space to be reserved for her in which to exhibit her automobiles.

Last winter I attended in Washington one of the famous dinners of the Gridiron Club. Among the other forms of entertainment was an exhibition of so-called Marconi wireless photographs, and the answer to the question of the chair, "Whom do the American people consider the real thing?" they showed us a picture of Captain Clark of the "Oregon." It seems to me that when you get down to the discussion of railroads in talking about your various means of transportation, you get down to "the real thing." I did think that perhaps you would be interested in hearing a detailed and technical account of how those roads were constructed, maintained, operated, financed and accounted, but afterward I concluded that perhaps it would be a little tiresome at this stage of the evening, so I thought, after some consideration, that, after all, the relation to the municipality could perhaps best be shown by a statement of the distribution of their money.

You have in Pittsburgh the Pennsylvania Railroad, the Pennsylvania Lines West of Pittsburgh, the Pittsburgh & Lake Erie and the Baltimore & Ohio. During the year 1902, estimating for November and December, those four roads, we shall have spent in Allegheny county for wages $16,000,320; for improvement, $10,203,003—that is, on their own property, $26,252,323. They will have bought in Allegheny county for supplies $13,002,000 worth of goods, and equipment to the amount of $17,998,000; that is, they will have spent here this year $57,752,323, one-fifth of what you people swear to be the valuation of your property for the purpose of taxation.

Lest it be said that this is an exceptional year, I have taken a period of six years, which embraced two years of hard times, two years of medium times and two years of very good times. In these six years these four roads have expended for wages $83,173,476; for improvements, $24,315,189; for supplies, $67,561,508, and for equipment, $41,525,158, a total of $256,575,531. Was there ever so splendid a customer as those roads constitute?

The character of the roads may be described, it seems to me, with the consciousness of a telegram. They are the creators of modern Pittsburgh. It is that instrumentality which assembles here the raw material upon which your people work and distribute from here the product of their toil. With their expenditure they energize and vivify your manufactures, and they bear more than their fair share of the uplifting of the civic body through the payment of their taxes. They are the most splendid of your citizens. They are the Cinderella of your household, the domestic drudge that yet awaits a man of mark who will make known their virtue and their graces. They are the door mat upon which no one of you, be he high or low, ever hesitates to wipe his feet.

Consolidation Locomotive for the Baltimore & Ohio.

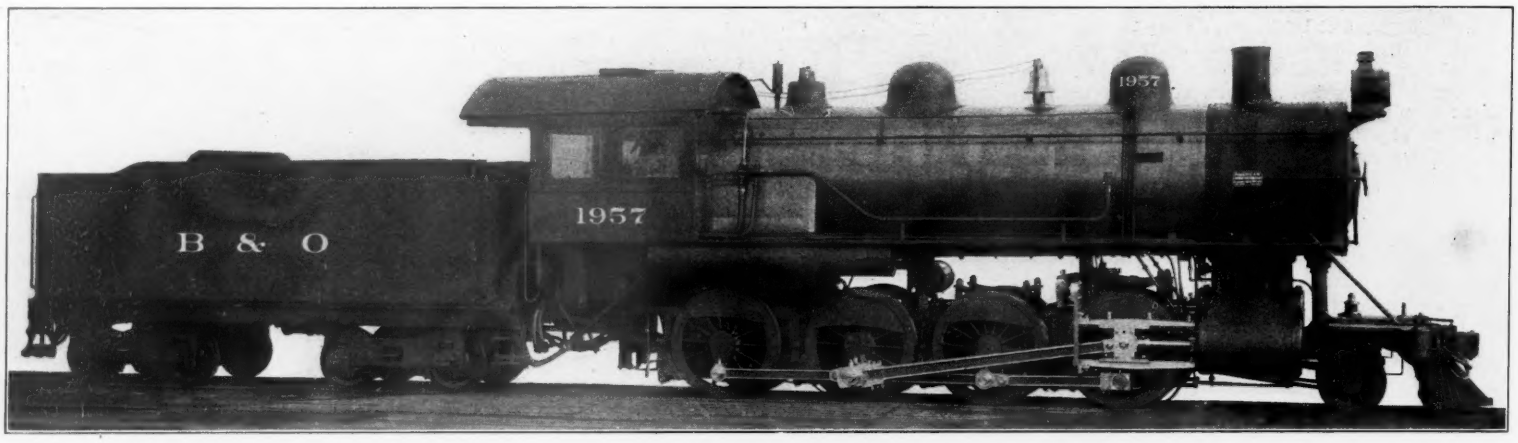
The accompanying engravings illustrate a consolidation locomotive built at the Schenectady Works of the American Locomotive Company for the Baltimore & Ohio Railroad.

A half plan of the wheel arrangement shows the method of allowing for lateral play without the use of blind drivers. The forward and rear pairs of drivers are 53⅛ in. between tires, and the second and third pairs are 53¼ in. between tires, thus allowing ⅛ in. play. The detail of the frame is also of interest.

The total weight of the engine is 186,000 lbs., with 162,000 lbs. on drivers. The maximum tractive effort is 37,600 lbs., which allows for a factor of adhesion of 4.3. The cylinders are simple 21 in. x 30 in. The total heating surface is 3,476 sq. ft. The ratio of heating surface to weight on drivers is 1 to 44.1. This latter value is less than that for any simple consolidation freight engine so far described, and should insure ample boiler capacity as well as high evaporative efficiency. The drivers are 57 in. in diameter and the working steam pressure 190 lbs. The grate surface is 50.3 sq. ft.

The tender is designed to carry 5,900 gal. of water and 10 tons of coal. Cast steel has been liberally used in many of the details of the engine such as frame braces, furnace bearers, etc. A general description follows:

Kind of fuel to be used	Bituminous
Weight on drivers	162,000 lbs.
Weight on truck wheels	24,000 lbs.
Weight, total	186,000 lbs.
Weight, tender empty	44,300 lbs.



Consolidation Locomotive for the Baltimore & Ohio.

General Dimensions.

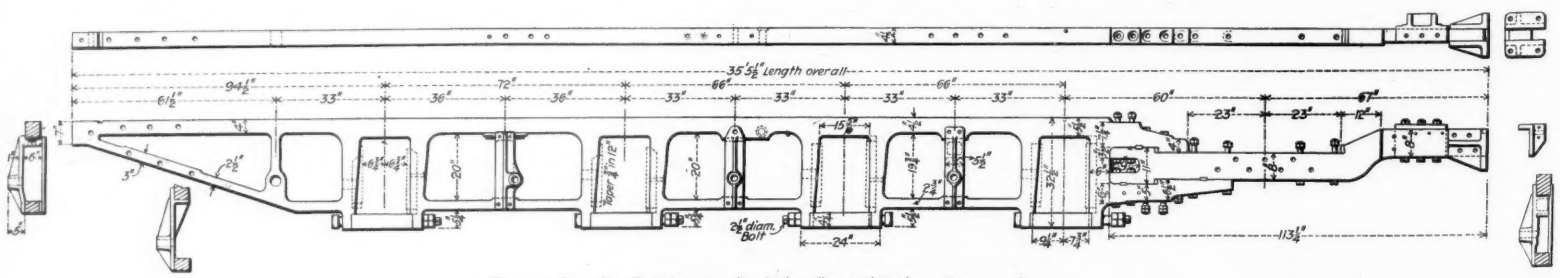
Wheel base, total, of engine	25 ft. 11 in.
Wheel base, driving	17 ft.
Height of stack, above rails	14 ft. 10 in.
Heating surface, fire-box	155.4 sq. ft.
Heating surface, water tubes	22.3 sq. ft.
Heating surface, tubes	3,298.1 sq. ft.
Heating surface, total	3,475.8 sq. ft.
Grate area	50.3 sq. ft.

Wheels and Journals.

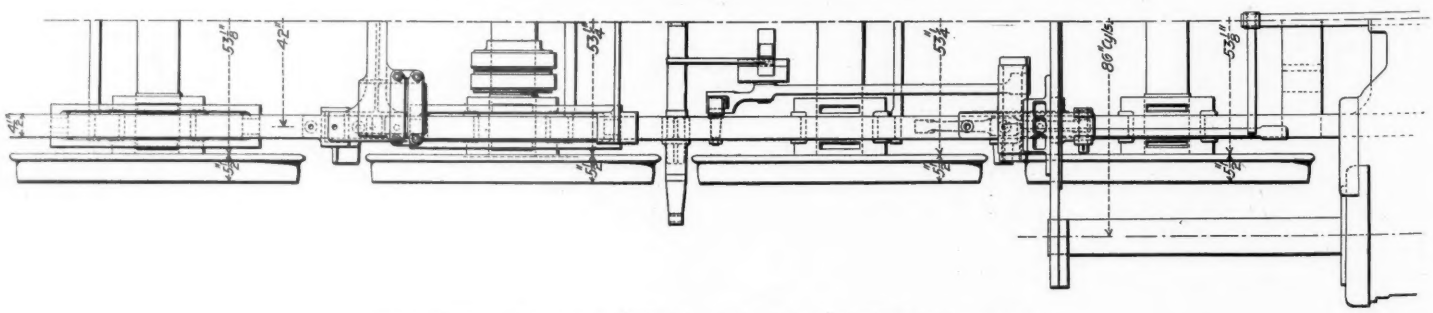
Drivers, number	8
Drivers, diameter	57 in.
Drivers, material of centers	Cast steel
Truck wheels, diameter	30 in.
Journals, driving axle, size	9½ and 9 in. x 12 in.
Journals, truck axle, size	6¼ in. x 10 in.

Cylinders.

Cylinders, diameter	21 in.
Piston, stroke	30 in.
Piston rod, diameter	4 in.



Frame Detail—Baltimore & Ohio Consolidation Locomotive.



Plan of Wheel Arrangement—Baltimore & Ohio Consolidation Locomotive.

Valves.

Valves, kind of	Piston
Valves, greatest travel	5½ in.
Valves, outside lap	⅞ in.
Valves, lead in full gear	3/32 in.

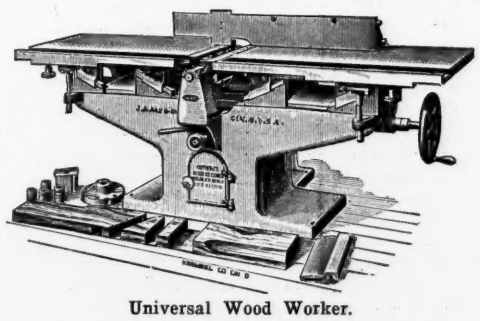
Boiler.

Boiler, type of	Straight top
Boiler, working steam pressure	190 lbs.
Boiler, diameter of barrel	72 in.
Seams, kind of horizontal	Sextuple
Seams, kind of circumferential	Double

Thickness of tube sheets	½ in.
Thickness crown sheet	⅝ in.
Crown sheet stayed with	1⅛ in. radial stays
Fire-box.	
Fire-box, length	7 ft. 7⅝ in.
Fire-box, width	6 ft. 3⅝ in.
Fire-box, depth front	73 in.
Fire-box, depth back	63 in.
Grate, kind of	Rocking
Tubes.	
Tubes, number	396
Tubes, outside diameter	2 in.
Tubes, length over sheets	16 ft.
Other Parts.	
Exhaust nozzle	Single
Exhaust nozzle, diameters	5 in., 5¼ in., 5½ in.
Stack, straight or taper	Straight
Stack, diameter	18 in.
Tender.	
Tank capacity for water	5,900 gals.
Coal capacity	10 tons
Type of under-frame	10 in. channels
Type of truck	Fox
Diameter of truck wheels	33 in.
Diameter and length of axle journals	5 in. x 9 in.

A Large Universal Wood Worker.

The universal wood worker, shown herewith, is designed to do a wide variety of work, saving the use of separate machines for the operations. An idea of its scope is given by the list of mill-work operations for which it may be used. It is made to plane 16-in. wide,



Universal Wood Worker.

and will plane material out of wind; surface straight or tapering; rabbet and face inside blinds; rabbet door frames; also bevel, joint, chamfer, bore, gain, bead, rip, cross-cut, tenon, rout, groove, make circular mouldings, and work of a similar nature.

Endeavor has been made to reduce to a minimum vibration and wear on parts, at the same time permitting rapid and accurate adjustment of the parts, changing of knives, etc., in order that the machine will save labor to the greatest possible degree.

An attachment for boring is mounted at the back of the column, having a table and necessary stops to regulate the cuts. A fence is also provided for angle boring, and a table is placed on top of the boring table for rotary mortising. The tables, which are 6 ft. long, are planed true and each has independent vertical and longitudinal adjustments, enabling them to be easily raised or lowered. The adjustable fence and bevel-rest requires no separate adjusting as it raises or lowers with the tables.

The machine is built by J. A. Fay & Egan Co., Cincinnati.

Improvements on the Union Pacific.

The annual report of the Union Pacific (reviewed by us Nov. 14) contains important particulars of the improvements recently carried out. Some of these are printed below:

The expenditures charged to capital account other than for bonds and stocks in companies other than the Union Pacific Railroad Company and auxiliary companies were as follows:

Construction of extensions and branches connecting with Oregon Short Line and the Oregon Railroad & Navigation lines		$1,220,313.48
Utah & Pacific Railroad, remainder of cost		557,773.62
Adjustment of old claims, etc		255,682.12
Betterments, Improvements and Equipment—		
Ballasting	$578,409.92	
Bridges, viaducts and culverts	801,959.20	
Shops, station buildings, signal and interlocking plants and other buildings	642,132.42	
Fencing, telegraph lines, shop machinery, real estate and other minor expenses	221,938.87	
Additional side and passing tracks	316,688.36	
Changes of line, reducing grades and widening embankments	1,302,477.95	
For 60 locomotives, 12 baggage, mail and express cars, 5 dining cars, 6 postal cars, 303 freight cars, and 10 road service cars	$1,443,134.90	
Less equipment sold, destroyed or condemned	859,380.31	
		583,754.59
Total expenditures		$6,481,130.53
Deduct for—		
Appropriation from Income Account	$2,000,000.00	
Equipment paid for from Improvement and Equipment Fund	647,908.09	
Receipts from special funds and sales of property	491,038.12	
		3,138,946.21
Charged to capital account		$3,342,184.32

Work on the change of line between Leroy and Bear River, Wyoming, was finished, and the new line and tunnel were opened for traffic Oct. 16, 1901. The completion of this new line has resulted in a saving of 9.56 miles in distance, and a reduction of 25.3 ft. per mile in maximum grade, and 1,371 deg. of curvature. Work was commenced March 1, 1902, on a minor change of line at Lookout, Wyo., which involves the construction of 3.04 miles of new line but will effect a saving of .19 mile in distance, .96 mile in curvature, and a reduction in maximum grade from 62 to 43 ft. per mile eastbound, and from 59 to 43 ft. per mile westbound. This will be finished about July, 1902.

The character of the betterments and improvements made during the year was as follows:

Miles of track ballasted with gravel	435.78
Miles of track ballasted with rock	6.22
Miles of track ballasted with burnt clay	56.88
Total miles of track ballasted	498.88
Lineal feet pile and timber trestle replaced with iron truss bridges	1,066
Lineal feet pile and timber trestle replaced with steel girder bridges	6,115
Lineal feet pile and timber trestle replaced with embankment	16,575
Total lineal feet pile and timber trestles replaced	23,756
Lineal feet iron bridges built replacing embankment	159
Lineal feet steel girder bridges built (pile and stone abutments)	3,874
Lineal feet steel truss bridges built (stone abutments)	2,734
Lineal feet iron and steel truss bridges replaced with heavier structures	1,420
Lineal feet (transversely to track) stone and concrete arch culverts	1,574
Lineal feet (transversely to track) iron pipe culverts	21,940
Cubic yards of masonry put in place	61,326
Miles of right of way fenced (track miles)	409.94
Miles of sidings and passing tracks built after deducting 22.15 miles of sidings taken up	56.68
Miles of roadbed widened	551.72
Cubic yards material moved widening embankments and filling trestles	1,985,592

The companies are providing additional shop facilities at Omaha, consisting of a machine and erecting shop 150 ft. x 398 ft., a boiler, tank and locomotive carpenter shop 150 ft. x 244 ft., a pattern and storage shop 50 ft. x 200 ft., a five-stall roundhouse and a power house, also new shops at Pocatello. All these buildings will be of a permanent character, supplied with machinery, tools and appliances of the most improved design; when they are completed, they will be of material assistance in making repairs with greater promptness and will effect a saving in cost of maintenance.

Including the change of line from Leroy to Bear River, Wyo., the following statement shows the work of this character done on the lines of the Union Pacific Railroad Company and the improvements effected thereby:

Location.	New line. Miles constructed.	New line. Distance saved, miles.	Maximum grade, feet per mile. Old line.	Maximum grade, feet per mile. New line.	Maximum curvature, degrees. Old line.	Maximum curvature, degrees. New line.	Total angle, degrees. Old line.	Total angle, degrees. New line.	Curvature, per cent. of line. Old line.	Curvature, per cent. of line. New line.
Buford to Laramie	29.63	*.37	97.68	43.3	6	4	1,187	1,273	25.8	30.6
Howell to Hutton	15.34	3.11	45.4	42.2	3	1	290	36	19.0	4.6
Cooper's Lake to Lookout	3.90	.38	52.8	43.3	5	1½	341	61	51.9	7.7
At Lookout	3.04	.19	62.0	43.3	3	1	151	10	36.0	6.6
Lookout to Medicine Bow	25.94	12.03	53.9	43.3	6	3	3,322	532	41.8	23.6
Allen to Dana	8.15	3.87	75.3	43.3	6	5	1,577	593	33.6	24.5
Edson to Walcott	.93	.04	60.0	43.3	6	4	215	79	79.8	45.5
Rawlins to Tipton	42.83	1.44	70.22	43.3	6	3	1,560	855	23.2	16.7
Green River to Bryan	10.64	.45	66.67	43.3	5½	4	893	462	50.3	36.6
Leroy to Bear River	21.61	9.56	68.6	43.3	5	3½	2,017	646	42.2	30.0
Total	162.01	30.70	....	...	..	..	11,553	4,547	...	...

*Increase.

Changes in line by reducing curvature and grades, and filling in timber and pile trestles, have been made on the lines of the Oregon Railroad & Navigation Company during the last five years, and this work is going on as rapidly as business conditions will permit. During the fiscal year just ended, 7.56 miles have been changed at a cost of $330,573.15, effecting a saving of .20 miles in distance, eliminating 963 deg. of curvature and reducing 61 ft. in rise and fall. There was expended also $109,326.82 in completing work commenced in the preceding year.

The additions to equipment during the year were charged to improvement and equipment fund, $647,908.09, and charged to capital account, $795,226.21; total, $1,443,134.90.

The locomotives added during the year averaged 93.70 tons total weight of engine without tender and 78.29 tons upon drivers. All the freight cars added during the year were of 50 tons capacity.

The locomotives and cars owned and their capacity at the close of the year were as follows:

	This year.	Last year.
Locomotives	787	832
Total weight, excl. tenders (tons)	52,101.00	51,364.00
Average weight (tons)	66.20	61.74
Total weight on drivers (tons)	41,680.00	40,244.00
Average weight on drivers (tons)	52.96	48.37
Passenger train cars	580	568
Freight train cars	21,081	22,500
Average capacity of standard-gage cars (tons)	27.36	26.30

Although there was a decrease of 5.41 per cent. in the total number of locomotives owned, there has been an increase in capacity of 9.49 per cent., resulting from the greater capacity of the locomotives purchased to replace the lighter weight locomotives placed out of service.

TECHNICAL.

Manufacturing and Business.

Charles H. Stoneback, editor of the Rand-McNally Official Railway Guide, has resigned, resignation to take effect Dec. 31.

The Edgar Car Lock & Seal Co. has been incorporated in New Jersey with a capital stock of $1,000,000, by Millard W. Baldwin, Gerald A. Griffin and Frank B. Searles.

The George W. Jackson Structural Iron & Bridge Works of Chicago has been incorporated in Illinois, with $100,000 capital, to engage in general contract work. The incorporators are Geo. W. Jackson, John J. Corbett and John T. Fanning.

E. V. Douglas, heretofore President of the Consolidated Lake Superior Co., from the beginning of the enterprise, has resigned on account of ill health, but will remain as a director. F. S. Lewis, heretofore Vice-President, succeeds Mr. Douglas.

M. Mitshkun Co., railway equipment supply dealers of Detroit, Mich., have opened a branch office in Chicago, Ill., for the accommodation of their Chicago and Western customers. They can be found after Dec. 1 at 711 Western Union Building.

The new foundry of the American Ship Building Company at Detroit will be equipped with 72 in. and 42 in. Newten patent cupolas made by Northern Engineering Works of that city. The new buildings are nearly under roof and when completed the plant will be a model one for heavy castings work.

Mace Moulton, M. Am. Soc. C. E., informs us that he has decided to leave Springfield, Mass., in order to open up larger opportunities. He has been practicing in structural engineering for more than 25 years, and his specialty for several years has been economical designs of metallic structures of almost every kind. He is free to consider a proposition looking to a business connection.

Some recent changes have been made by the Chicago Pneumatic Tool Co. in its representatives in this country. Geo. A. Barden, who has been representing the company at Buffalo, N. Y., has been transferred to the Philadelphia field, and C. R. Green, who has been connected with the Cleveland office, has succeeded Mr. Barden in Buffalo. Chas. Parsons, who recently became connected with the company, is now traveling in the Northwest.

Gilbert & Peddle is the title of a firm organized Dec. 1 for architectural work and especially for designing and building railroad structures. Bradford L. Gilbert has been long well known as the architect of many railroad stations, office buildings and other railroad structures. He also has a title to fame as the inventor of the skeleton steel construction for tall buildings. This honor was the subject of some controversy, but there was no question as to his originality, although it left a shadow of doubt on the unimportant fact as to whether or not Mr. Jenney, of Chicago, who was working at the same problem, antedated him. William H. Peddle, who is now associated with Mr. Gilbert, has been all of his business life in railroad service as an engineer, superintendent and superintendent of transportation. He began in the engineer corps of the Evansville, Terre Haute & Chicago Railroad; served as a roadmaster, division engineer and Division Superintendent of the Central Railroad of New Jersey, and as Superintendent of Maintenance, Assistant General Manager and Superintendent of Transportation of the Southern Railway. This new professional firm is well equipped with skill and experience.

Iron and Steel.

The New York Stock Exchange has listed the stocks of the American Steel Foundries Co.

Berthold Goldsmith, General Manager of the Indiana plant at Richmond, of the American Tin Plate Co., has been transferred to Pittsburgh.

It is estimated that the production of rails this year will amount to 2,600,000 tons, and that for next year will probably be 3,000,000 tons.

According to despatches from Hartford, Conn., the American Tube & Stamping Co. is about to issue bonds for $1,500,000 to develop the plant.

William E. Davis, for many years Superintendent at the Rogers Locomotive Works, at Paterson, N. J., died on Nov. 13, at his house in Jersey City, aged 82 years.

The Labelle Iron Co., of Wheeling, W. Va., has decided to issue $2,500,000 of stock, making its aggregate $7,500,000. The object is to continue improvements at the Steubenville mills.

S. Tada, Chief Constructing Engineer, accompanied by M. Matsuaka and G. Higuchi, chiefs of the naval construction of the Japanese Navy, will soon visit Pittsburgh and are expected to place orders for steel and armor plate for their Government.

On Dec. 2 the final arrangements to consolidate 17 of the leading malleable iron concerns in the United States were made at Detroit. The new company will have a capital from $16,000,000 to $20,000,000, and the headquarters will be in New York. W. C. McMillan, of the Michigan Malleable Iron Co., was active in carrying on negotiations.

It is reported that the general offices of the United States Steel Corporation will be removed from New York to Pittsburgh. The companies which will be removed will be the Federal Steel Company, American Bridge Com-

pany, American Tin Plate Company, American Sheet Steel Company, American Steel & Wire Company, Illinois Steel Company and Shelby Tube Company. The offices of the Carnegie Steel Company, National Steel Company, American Steel Hoop Company and National Tube Company are already located in Pittsburgh, as well as part of the American Sheet Steel Company.

Iron and Steel Works for India.

Newspapers have recently spoken of the project of Mr. Tata to build blast furnaces and steel mills in India, saying that 12 million dollars will be spent, that a great amount of machinery will be bought, etc. This is all premature. Mr. Tata has recently been in the United States making careful investigations, and Mr. C. P. Perin, Consulting Engineer, New York, has been helping in his studies. Mr. Perin is now sending an engineer to India to examine the properties there and make further reports to Mr. Tata. It is likely that something important will come of all this, but up to the present time nothing has been decided and nothing will be done immediately.

Street Railroad, Lighting and Power Franchise in Manila.

Competitive bids will be received until March 4, 1903, by the Municipal Board of Manila, Philippine Islands, at which time franchise will be granted to furnish a street railroad in Manila; also lighting and power in the city. The route as outlined for the railroad is 35 miles long. Particulars can be had from the Bureau of Insular Affairs, War Department, Washington, D. C., Colonel Clarence R. Edwards, U. S. Army, in charge.

The DeLaval Train Lighting System.

The DeLaval system of generation for electric train lighting, mention of which was made in our issue of Nov. 14, page 877, is installed on one of the Pennsylvania Limited trains. The generating unit is of 20-k.w. capacity, supplying 160 amperes at 125 volts, the speed being 2,000 r.p.m. Before installing this set the Pullman Company conducted a series of tests with different sizes of nozzles and under varying load conditions to determine the best obtainable economy. Under full load with two nozzles having diameters of 0.3543 and 0.4134 in. respectively a steam consumption per brake horsepower per hour of 38.95 lbs. was obtained. A reduction of the load to 56 per cent. and cutting out one nozzle, the smaller of the two, increased the steam consumption to 41 lbs. So far as we know this is by far the most favorable figure ever obtained for service of this kind. The Pullman Company has ordered 10 additional units from the New York Headlight & Train Lighting Co., who control the DeLaval system for the United States, Mexico and South America.

The Boston Tunnel.

A small contract ($37,000) has been let by the Boston Transit Commission to Harry P. Nawn, of that city, for work in connection with the new State street station of the East Boston tunnel.

United States Steel Corporation's Improvements.

The annual tour of inspection by the chiefs of departments of the United States Steel Corporation will be begun on Dec. 9 and practically all the mills of the company will be visited. This inspection trip is of more than usual interest because of the plans of the Corporation for spending about $25,000,000 to $30,000,000 on improvements and new plants. The delay in carrying out these plans has been on account of the litigation concerning the stock converting plan, but an officer of the company recently said that "the big surplus of the corporation, with assurances that earnings will continue large for at least two years—it is unsafe to make predictions beyond that time—justifies the corporation in going ahead with its improvements and additions notwithstanding what action the courts may take. The fact is we have already got so far along with our extension plans that it would be folly for us to abandon them should the bond-conversion plan fall through. We have already started our new bridge plant, completed our plans looking to an extension of our tube mills in McKeesport, and made other expenditures. The additional ground necessary for the McKeesport extensions has already been purchased. We believe it will be to the interest of the company to meet the expense involved in these extensions through the sale of additional bonds. It would not be good policy to put all our surplus into extensions. Consequently, I believe, in the event of an unfavorable decision by the courts, the extension plans will be carried over a longer period. That is, if we should decide not to issue $50,000,000 additional bonds, which we have a right to do even if the courts should render a decision against the conversion of $200,000,000 of stock into bonds."

Ore Handling Plant at Sharon.

The Brown Hoisting Co., of Cleveland, has a contract with the Union Steel Co., of Sharon, Pa., to install at the South Sharon works a conveying plant for unloading, storing and charging ore. The contract amounts to $350,000.

Progress of the Simplon Tunnel.

The U. S. Consul at Geneva, under date of Nov. 6, 1902, says: "The total advance in the works of the Simplon Tunnel up to Oct. 31, 1902, was 13,608 meters (44,648 ft.). Of this, 8,060 meters (26,445 ft.) was on the Swiss side and 5,548 meters (18,203 ft.) on the Italian. In October, the progress of the work was 359 meters (1,177 ft.), an average of 11.58 meters (38 ft.) per diem. The water flow has been 40 liters (10.5 gallons) per second in the north and 109 liters (28.8 gallons) in the southern sides. The time for the completion of the tunnel," adds the Consul, "has been extended beyond 1904, the date first contracted for."

Locomotives and Rails in Austria.

The Austrian State Railroads early in November let contracts for 42 locomotives and as many tenders to four Austrian works. The prices are slightly lower than a year ago; the bidders say that the cost to them is about the same as then; for while copper and some plates are lower, steel and cast iron are higher. The State Railroads have also let contracts for rails for two years to come; an old contract made for five years had just expired.

Anacostia River Improvement.

Bids were opened at Washington, D. C., on Nov. 26, by Lieut. Col. C. J. Allen, Corps of Engineers, U. S. Army, for dredging and furnishing riprap for improving the Anacostia river, at Washington, under the appropriation made by Congress last winter. For dredging the bids were: Sanford & Brooks Co., of Baltimore, Md., for dredging in the channel, 10.95 cents a cu. yd.; for dredging in the trench, 14.75 cents a cu. yd.; total amount of bid, $136,710. Atlantic, Gulf & Pacific Co., of New York, dredging in the channel 13.4 cents a cu. yd.; in trench, 13.4 cents a cu. yd.; total amount of bid, $165,624. Coastwise Dredging Co., of Wilmington, Del., dredging in channel, 13.5 a cu. yd.; dredging in trench, 18 cents a cu. yd.; total amount of bid, $168,480. Henry Steers, Jr., New York, dredging in channel, 15.5 cents a cu. yd.; dredging in trench, 20 cents a cu. yd.; total amount of bid, $193,200. For riprap stone the bids ranged from $1.07½ a cu. yd. to $1.83 a cu. yd., the total amounts of the bids being from $8,600 to $14,640, all the bidders being of Washintgon, D. C.

Illinois Car Company.

The Illinois Car Co., which has just been incorporated in New Jersey, with $50,000 capital stock, will take over the plant of the Illinois Car & Equipment Co., at Urbana, Ohio. It is said H. A. McCord, brother of A. C. McCord, President of the Western Steel Car & Foundry Co., is one of those interested in this new concern. The names of the incorporators given are Robert S. Green of Elizabeth, N. J., and Russell C. Leffingwell of Yonkers, N. Y.

Superheated Steam in Locomotives.

In our issue of Oct. 10 (page 775) appeared an important description of Schmidt's plans for using highly superheated steam in locomotive engines. With that description were quite complete illustrations and also reports of German tests. We are informed that the patents on Schmidt's system, for all English-speaking countries, are owned by Schmidt's Superheating Company, Limited, Broad Sanctuary Chambers, Westminster, London, England. The agents in America are the Providence Engineering Works of Providence, R. I. Besides the engines on the Prussian State railroads, trials of this system are under way on the Canadian Pacific, and the company has orders for the Cape Government Railways of South Africa.

New Dining Cars for the Lehigh Valley.

The Lehigh Valley has put in service two new dining cars built by the Pullman Company at Chicago from plans and specifications by the railroad company. They are 72 ft. 6 in. long over sills, 9 ft. 8 in. wide over sills, and 10 ft. ¼ in. over all. Pullman standards have been largely used. The car is framed in their usual manner with anti-telescoping device, steel platforms and wide vestibules. Pullman 5-a trucks with the Hodge triple brake arrangement, giving a braking power of 90 per cent. of the weight of the car are applied under the car. The dining room, which seats thirty persons, is finished in Cuban mahogany, with handsome veneered panels. Combination fixtures for Pintsch gas and electric lights are provided for both the center and side lamps. The kitchen is finished in oak and contains, besides a coal range, steam tables, grilles and ample lockers. The floor is covered with copper and wood drain mats. Opalescent glass is used in the fixed sash of the side windows and oval windows, as well as in the deck sash. The ceiling, which is of the full Empire type, is decorated with gold leaf. Lehigh standard finish with aluminum striping has been used on the exterior.

Cincinnati Car Company.

The Cincinnati Traction Company owns the entire capital stock of the Cincinnati Car Company, which will lease from the Cincinnati Traction Company its present extensive shops at Cincinnati, Ohio, which buildings now cover approximately 10 acres, to which the car company will make extensive additions. Cars are now being built in these shops for a number of large traction companies in the New England States and the Middle West. W. Kelsey Schoepf is President and General Manager.

Car Heating—Infringement of Patents.

The Safety Car Heating & Lighting Co. sends the following: "Our attention having been called to the fact that a method of car heating is being offered to railroad companies which embodies a water circulating system heated by a series of steam jackets, we deem it our duty to call your attention to the fact that we have submitted the details of this construction to our patent counsel, who has advised us that such construction undoubtedly infringes (among others) U. S. patent issued to R. M. Dixon, No. 457,706, dated Aug. 11, 1891, and W. C. Baker, No. 411,915, dated Oct. 1, 1889, both of which patents are owned by this company. Without desiring to interfere with legitimate competition, we wish to notify the users of car heating systems and the public generally that we must of necessity protect and defend our interests after having expended large sums of money in perfecting our systems. We do this in order that examination may be made with reference to these patents before a final decision is reached upon any such system presented for consideration."

THE SCRAP HEAP.

Notes.

Press despatches from Chicago say that three ticket brokers who have been on trial in that city for two weeks on charges of forgery have been convicted and sentenced to the penitentiary.

The Illinois Central is going to have four through trains daily between Chicago and New Orleans and the fastest train will be run through in 24 hrs. 40 min. The train now leaving Chicago at 8:30 a. m. will not start until 10 a. m. The 6:25 p. m. train will start at 7, and will carry only first-class passengers, and, according to the Chicago papers, will be composed exclusively of "Pullman equipment."

The Municipal Government of the District of Columbia is complaining against the railroads for discriminating against that city in the distribution of anthracite coal, and a committee has been appointed by the Board of Trade to take formal action, if practicable. It was stated this week that coal was nearly as scarce as during the height of the strike; and the cloud of black smoke over the city is even greater than it was a month or two ago. It is alleged that the railroads are favoring Philadelphia and New York at the expense of Southern cities.

The Florida State Commission has fined the Louisville & Nashville Railroad $7,000 for violating its order prohibiting any railroad from declining to transport freight. The charges were nine in number, each specifying that the road failed and refused to transport cottonseed offered to it by shippers at stations on its line in west Florida and consigned to the Florida Cotton Oil Co., at Tallahassee. The evidence tended to show that the road's action was designed to divert all cottonseed shipments to Pensacola, which would enable it to get a longer haul, and also give it the haul of the finished products coming from the Pensacola Cotton Oil Co.

Traffic Notes.

There appears to be a little disturbance in the rate situation at St. Paul. There is trouble over passenger rates and a difference between the Canadian Pacific and the roads this side of the line over the continuation by the transcontinental lines of settlers' rates to the Pacific northwest.

Mr. P. S. Eustis, sitting as arbitrator in the Big Four passenger differential case, rules that the Big Four is not entitled to an arbitrary on western business out of Cleveland. He says: "If there is any foundation for the suspicion that the opponents of differentials who have sought industriously for several years to have them abolished are back of this case, the arbitrator's findings will not end it." This is an intimation that there is likely to be further trouble over the old differential question.

The plan of the southwestern roads to foster colonization by the establishment of an immigrant bureau appears to be generally approved by all the parties in interest. The Atchison has for some time been giving considerable attention through its industrial department to the fostering of new industries along its lines. The latest project is undertaking to reclaim a large tract of river bottom land in Texas by constructing a canal and pumping works. The proposition is to devote the reclaimed land to rice cultivation.

C. L. and L. C. L. Rates From St. Louis to San Francisco.

The Interstate Commerce Commission in an opinion by Commissioner Prouty has announced its decision in the case of the Business Men's League of St. Louis against the Atchison, Topeka & Santa Fe and others. Following is a brief summary of the decision:

With water competition compelling low all-rail freight rates from New York to San Francisco and other Pacific Coast terminals, a showing that the distance is less and that graded rates were formerly in force is not sufficient to warrant an order requiring lower rates from St. Louis, Chicago and other interior points than from New York on traffic carried by rail to Pacific Coast destinations.

The difference between carload and less than carload rates from St. Louis, Chicago and other points in the Middle West to Pacific Coast territory, which are the subject of complaint herein, and which average about fifty cents per 100 pounds, are not, taking the rate adjustment as a whole, and giving due consideration to the controlling force of water competition between the eastern seaboard and the Pacific Coast, difference in the cost of service by rail, the interests of the parties, preservation of reasonable competition between the Middle West and the Pacific Coast jobbers, and other material circumstances, shown to be unjust; but while the tariff cannot be condemned as a whole upon grounds urged by complainants, many of the details in such tariff are in violation of law.

The commodity tariff applying on traffic from the Middle West to Pacific Coast territory names rates upon over 400 commodities in carloads only, leaving the movement of these commodities in less than carloads to be governed by the greatly higher class rate provided for such shipments and producing a differential as between carload and less than carload quantities which, even under the peculiar circumstances of this traffic, is in many cases excessive; and the tariff is also to some extent unlawful in that it specifies a number of varied commodity rates, especially for the hardware schedule, and unduly prevents in some instances the shipment of articles of the same class in mixed carloads at carload rates.

In the adjustment of carload and less than carload rates circumstances often render proper the application of a greater differential in one case than in another; but taking the traffic generally from the Middle West to

Pacific Coast territory, it is held that a differential as between carloads and less than carloads which is at once more than 50 cents per 100 pounds and more than 50 per cent. of the carload rate is prima facie excessive. It does not follow that every differential may equal this, or that every differential which exceeds this is unlawful, but any differential in excess of this requires special justification.

While on traffic from the Middle West to the Pacific Coast many differentials in the rates named for carloads and less than carloads are too great, while varied commodity rates in the hardware schedule and perhaps in some others should be readjusted, and while in some instances greater latitude should be given in the shipment of practically the same articles in mixed carloads, the present record, which pertains almost wholly to the general aspect of the controversy, furnishes no facts from which it can be intelligently determined what ought to be done in specific instances, and further hearing at St. Louis, Mo., on the second Tuesday in February, 1903, is accordingly ordered.

The question whether on traffic from the Middle West the present rates to intermediate points which are higher than those to Pacific Coast terminals are lawful was not litigated at the hearing, and while the Commission will not of its own motion proceed in that branch of the case, complainants are granted leave to do so if they desire.

A New England Arbitrary Declared Unlawful.

The Interstate Commerce Commission in an opinion by Commissioner Prouty has announced its decision in the case of the Diamond Mills against the Boston & Maine. The complainant brings grain from western points to Buffalo, N. Y., where it is milled, and ships the product to points on defendant's line in New England. The through tariff rates on grain and grain products from the points of origin to New England points are the same, but no right of milling-in-transit is granted in the joint tariff. Under a regulation of the Lake Shore road, one of the parties to the tariff, and on whose line complainant's mill is located, milling-in-transit is permitted for 1½ cents per 100 lbs. above the rate on grain, but defendant does not join in granting that privilege to shippers from western points to points on its line in New England, and when grain so milled in transit is received by defendant it imposes an arbitrary charge of 6 cents per 100 lbs. The sum of the rate on separate shipments of grain from the west to Buffalo and the established joint rate of 12 cents on grain products from Buffalo to points on defendant's line is less than the through grain rate added to the defendant's 6-cent arbitrary. The Commission holds that shippers are not entitled as matter of right to mill grain in transit and forward the milled product under the through rate in force on the grain from the point of origin to the place of ultimate destination, but that, on the contrary, milling-in-transit is a special privilege for which extra compensation is usually exacted by carriers and which is only permitted by them under prescribed terms and conditions; that the defendant, as party to a joint tariff which does not give shippers the privilege of milling-in-transit, acted within its legal right in notifying its immediate connections and the complainant that it would not permit that practice; that the railroad company did act unlawfully in imposing the arbitrary charge of 6 cents in addition to the through grain rate on complainant's milled products forwarded from Buffalo, and that it was and is bound to apply on such transportation from Buffalo its established joint rate from that point. The complainant is awarded reparation in the sum of $358.81, representing the difference between charges exacted according to the 6-cent arbitrary above the through grain rate and the sum of established rates on grain to and on milled products from Buffalo.

The Fastest Regular Train in Europe.

A start-to-stop run is given by the North Eastern from Darlington to York at 61.7 m.p.h., the fastest run in Europe, since on Nov. 2 the Nord run at 63.5 disappeared. Accelerations have been more or less general in the Kingdom, but the London-Manchester service has benefited especially, the time being reduced to 3 hours 50 minutes by the Midland. Some of the Continental service also have been accelerated.

Chicago's Municipal Works.

The message of the Mayor of Chicago, issued last April, and the 26th annual report of the Department of Public Works of that city, have just been published in pamphlet form. The Mayor says drastic remedies are needed to relieve the city of its financial embarrassment. The various municipal plants of the city seem to be inadequate; the city lighting department, the public works department, etc., need extensive improvement; the bridges of the city are in bad shape, while municipal poverty prevents replacing them with new bridges of modern type suited to the commerce of the river. In the City Engineer's report there is reference to the work done during the year 1901 by the Division of Bridges and Viaducts, which reports plans under way for the new bridge over the North Branch of the Chicago River at West Division street; for a temporary bridge at Black Hawk street, over the North Branch, and for a pontoon bridge at Canal street over the South Branch. Plans were also made for a proposed elevation of Kinzie and Canal streets to connect with the Milwaukee viaduct. The bridges now building are a bascule bridge over the Calumet River at 95th street, by Roemheld & Gallery; Claybourn Place bridge by Fitzsimmons & Connell Co., substructure, and American Bridge Co., superstructure; East Division street bascule bridge over the North Branch canal, by Roemheld & Galiery. The report of John O'Neill, Superintendent of the Department of Track Elevation, says that there has not been as much work done in 1901 as in former years owing to high prices of labor and material. The work done, however, was of a satisfactory character, such as the elevation of the joint work between the Chicago & Alton, the Chicago, Madison & Northern, and the Atchison, Topeka & Santa Fe, from the bridge across the South Branch at Bridgeport, to a point west of Wallace street, a distance of 5.25 miles of main track, and about 15 miles of other tracks, eliminating 13 grade crossings by subways, at an estimated cost of $1,200,000. There are numerous half-tone illustrations showing progress of the work of elevating the tracks along Eighteenth street. There are also a number of engravings showing the work of building intercepting sewers by the Department of Public Works.

Double Crews in Europe.

The practice of double crewing is spreading in England and on the Continent, though so far as I know there is no pooling being tried. During the exposition at Paris one French line tried pooling, but found the practice most unsatisfactory: the coal consumption went up to an extent that soon wasted any saving from the pooling.

In Austria the new Atlantic type engine designed by Herr Gölsdorf is being double crewed and the practice is giving perfect satisfaction. The crews work alternate days. R. HOPE.

Long Engine Runs.

The Northern of France has just arranged that its engines should run from Paris as far as Liege in Belgium, which is mostly over its own lines since the Nord Belge is its property. The distance is 225 miles, thus making it the longest run without change of engine done in western Europe, though it is *reported* that the 330 miles from the Spanish frontier to Madrid are run with the same engine with a change of crews; the time is about 15 hours.

A Suspended Electric Railroad.

The famous John Cockerill Works, of Seraing, Belgium, has submitted to the Belgian government a plan for a suspension railroad to be worked by electricity at the highest speed between Brussels and Antwerp; a route over which a few years ago the government purposed to build on the surface a high-speed railroad, but did not get authority from Parliament.

Pressed Steel Car Company.

The president makes the following statement pertaining to the business done by this company during the three months ending September 30: Net earnings (less repairs and renewals), $1,345,526.86; three months' interest, $59,225.00; preferred stock dividend on $12,500,000, at 7 per cent. per annum for three months to date, $218,750.00; reserve for depreciation, $80,441.49. Total charges, $358,416.49. Surplus earnings for third quarter of the year 1902, $987,110.37.

The Pacific Cable.

Arrangements have been completed by which the deep-sea soundings made by the Navy Department are to be turned over to the Commercial Cable Co. for use in laying the Pacific cable beyond the Hawaiian Islands. The charts will carry the cable beyond the Hawaiian Islands to the Midway Islands, and from the Midway Islands to Guam. From Guam two links will extend, one to Manila and the other to Yokohama.

Pensions on the Union Pacific and Its Allied Lines.

It is announced that beginning with Jan. 1 old employees of the Union Pacific will be retired on pensions; and that the plan, which will be similar to that in force on the Pennsylvania road, will also be adopted on the Southern Pacific, the Oregon Short Line and the Oregon Railroad & Navigation Company. Employees who have attained the age of 70 and have been in the service 20 years or more are to receive a pension. Between ages of 61 and 70, employees incapacitated for further work may be retired by a pension board selected from the department officers of the company, provided they shall have been in the service 20 years or more.

101 Miles in 100 Minutes.

On the morning of Tuesday, Nov. 25, the Twentieth Century Limited of the Lake Shore & Michigan Southern was run from Elkhart, Ind., to Chicago, 101 miles, in 1 hour 40 minutes. The train consisted of six cars and was drawn by engine No. 603. Speed was slackened at Mishawaka, South Bend and La Porte and also once to take water.

The New York Central and the Manhattan.

A Manhattan stockholder close to the management says that the lease of the Manhattan to the Interborough is in no way detrimental to the interests of the Central. The plan which has been under consideration for some time for a closer relation between the New York Central and the Manhattan will not be interfered with by the change in control. The ultimate combination will undoubtedly be effected by a cross-over from 155th street to Mott Haven which will give the Central an opportunity to transfer all its suburban business to the Interborough at 155th street and 138th street. The plan which has been under consideration by the New York Central for some time provides for a third rail system on both the Hudson and Harlem Divisions and the transferring of solid trains, electrically equipped, from the main line to the elevated.

Dress Parade.

We find the following in a Washington despatch: "President Loree, of Baltimore & Ohio, says he will do all he can to promote the erection of the proposed new passenger station here, although it involves great expense to the road without a cent of corresponding gain. Mr. Loree says: 'I am a believer in freight. The passenger business is the dress parade part of the railroad business. We build fine coaches and throw them away for finer coaches in a friendly competition with each other. We erect mammoth stations and tear them down to erect larger stations. Every business has its display features, and this is ours. I do not believe the passenger department of any railroad is self-supporting. More money is spent in these luxuries than is ever received in fares. The passenger business does not pay and never did. Every substantial enterprise has its frills and decorations and the passenger business forms ours. Yes, I will do all I can to promote the erection of the station, for these things are necessary after all to show what a great railroad is and how great it is.'"

How pleasant it is to get straight talk!

LOCOMOTIVE BUILDING.

The Baldwin Works is building seven locomotives for export to Japan.

The Louisiana & Northwestern is having two locomotives built at the Baldwin Works.

The Macon, Dublin & Savannah is having two locomotives built at the Baldwin Works.

The West Side Belt, Pittsburgh, is having two locomotives built by the American Locomotive Co.

The Wrightsville & Tennille has ordered from F. M. Hicks, one eight-wheel locomotive to be rebuilt at the Hicks Locomotive & Car Works.

The Chicago, Indianapolis & Louisville has ordered two 12-wheel freight locomotives from the American Locomotive Co., for October, 1903, delivery. These engines are to be duplicates of the last of this class of engine built by the Brooks Works of the American Locomotive Co.

The Pittsburgh & Lake Erie, as reported in our issue of Nov. 28, has ordered 30 consolidation engines from the American Locomotive Co. Type, simple, with total weight of 192,000 lbs., and weight on drivers, 172,000 lbs.; cylinders, 21 x 30 in.; diameter of drivers, 51 in.; straight boilers, with working steam pressure of 200 lbs., and 402 iron tubes. Tubes will be 14 ft. 9 in. long and 2 in. outside diameter; fire-box of carbon steel; tank capacity for water, 7,000 gal.; coal capacity, 10 tons. Special equipment includes Westinghouse brakes, steel axles, Gould couplers, Monitor injectors, Paxton-Mitchell piston rod and valve rod packings; Coale safety valves; Economy sanding devices; Nathan sight feed lubricators; Railway Steel Spring Co. springs, Latrobe driving wheel, truck wheel and tender wheel tires, and steel wheel centers.

The Atlanta & West Point has ordered two simple switch engines from the Rogers Works for June and July, 1903, delivery. They will be of the six-wheel connected type, weighing 110,000 lbs. on drivers, cylinders 19 x 24 in.; diameter of drivers, 51 in. outside of tire, straight top boiler, with radial stays and a working steam pressure of 180 lbs.; total heating surface, 1,464 sq. ft.; number of tubes approximately 225, 11 ft. 3 in. long x 2 in. outside diameter; fire-box 96 in. long and 33 in. wide; grate area, 22 sq. ft.; tank capacity for water, 3,500 gal.; coal capacity, 3½ tons. Special equipment includes Westinghouse brakes, hammered steel axles, Keasbey & Mattison boiler lagging, National hollow brake-beams, Lappin steel-back brake-shoes, Tower couplers, Buck headlight, No. 8 Monitor injectors, M. C. B. Ajax metal journal bearings, Jerome piston rod and valve rod packings, Crosby safety valves, Waters sanding devices, Nathan sight feed lubricators, Scott springs, Crosby steam gages, Latrobe driving wheel tires and cast tender wheel tires.

CAR BUILDING.

The Evansville & Terre Haute is in the market for 500 coal cars.

The St. Clair Terminal is having 75 freights built by the Pressed Steel Car Co.

The Somerset Ry. is having 25 freights built by the American Car & Foundry Co.

The Missouri Pacific has ordered 500 gondolas from the American Car & Foundry Co.

The Central of Georgia is in the market for three first-class and three second-class coaches.

The Bangor & Aroostook is having 15 freights built by the American Car & Foundry Co.

The National Salt Co. of Mexico has ordered 33 cars from the American Car & Foundry Co.

The Kansas City Southern has ordered 15 cabooses from the American Car & Foundry Co.

The Louisiana & Arkansas is having a few coaches built by the American Car & Foundry Co.

The West Virginia Northern is in the market for cars, the kind of cars having not yet been decided.

The American Car & Foundry Co. has miscellaneous orders for approximately 250 cars of various types.

The Cleveland, Cincinnati, Chicago & St. Louis is in the market for 2,000 box cars of 80,000 lbs. capacity.

The Tennessee Central is having 14 coaches built at the Jeffersonville Works of the American Car & Foundry Co.

The St. Louis & San Francisco has ordered 1,000 box cars and 1,000 gondolas from the American Car & Foundry Co.

The Chicago, Burlington & Quincy is again in the market for coaches. The number desired is thought to be about 60.

The Pullman Co. is building 24 cars for its general passenger service, four of which are being built at the California shops.

The Missouri, Kansas & Texas has ordered 50 excursion passenger cars, 200 box cars of 80,000 lbs. capacity, and 1,300 box cars of 60,000 lbs. capacity from the American Car & Foundry Co.

The Southern Pacific has ordered 1,600 box cars of 80,000 lbs. capacity and 500 stock cars of 60,000 lbs. capacity from the Western Steel Car & Foundry Co. These cars are to be equipped with pressed steel underframes.

The New York Central & Hudson River has ordered 150 standard ballast cars, 40 ft. long and of 80,000 lbs. capacity, and four standard double plow distributing cars, 32 ft. long and of 60,000 lbs. capacity, from the Rodger Ballast Car Co. The ballast cars are for February delivery and will be equipped with air-brakes and couplers.

F. M. Hicks, of the Hicks Locomotive & Car Works, has received miscellaneous orders for rebuilding freight cars from the Inter-Urban, Sumter & Choctaw, Salem City & Oregon and Big Stone Gap & Powell's Valley Railroads, and also from the American Bridge Works of Pittsburgh; the Congress Consolidated Mines Co., of Congress, Ariz.; the Deering Harvester Co., of Chicago; Moshannon Coal Mining Co., of Houtsdale, Pa.; W. H. Coleman Co., of Indianapolis, and the Tombstone Consolidated Mines Co., of Congress, Ariz.

BRIDGE BUILDING.

AKRON, OHIO.—An ordinance is pending in the Councils ordering plans made for a viaduct over the railroad tracks on Exchange street. Chas. H. Isbell, City Clerk.

ALLEGHENY, PA.—Bids are wanted Dec. 11 for building a bridge over Woods Run valley on Shady avenue. D. L. Fulton, Director of Public Works.

BOSTON, MASS.—It is estimated by the City Engineer that the Wordsworth street bridge at East Boston will cost $4,500.

BUFFALO, N. Y.—Bids are wanted until Dec. 12, by the Department of Public Works, for the substructure of the bridge on South Park avenue over Cazenovia Creek. Francis G. Ward, Commissioner.

CAMDEN, N. J.—It is reported that the Pennsylvania R. R. will be ready for bids after Jan. 1, for elevating the tracks through Camden.

CHANDLER, OKLA. T.—Bids are wanted on Dec. 15 for building nine steel bridges, according to plans on file at the County Clerk's office. H. Holliday, Chairman.

CHARLEROI, PA.—The Charleroi & Monessen Street Railroad Bridge Co., of which Theo. J. Allen is President, it is said, is having plans and specifications made for its proposed bridge over the Monongahela between the two towns named. The total length of the new bridge will be 1,700 ft., and the estimated cost is $175,000. Henry Lamb, of Pittsburgh, is reported as the Engineer.

CINCINNATI, OHIO.—Bonds to the amount of $10,000 have been issued by the County Commissioners for the bridge over Mill Creek between Reading and Lockland.

Dallas, Texas.—The Dallas, Cleburne & Southwestern R. R. will need a steel bridge over Trinity River. H. A. Genung, Cleburne, Texas, is Chief Engineer.

Detroit, Mich.—The proposition to build a railroad bridge across the Detroit River is again attracting considerable attention.

Duryea, Pa.—The Grand Jury has recommended that a new bridge be built over the Lackawanna River at this place.

Eugene, Ore.—New bids are wanted for the bridge at Cottage Grove. E. W. Lee, County Clerk.

Fremont, Neb.—Bids are wanted until Dec. 30 for supplying all bridge work needed during the year 1903. Geo. A. Murrall, County Clerk.

Georgetown, Colo.—Bids are wanted Dec. 30, according to report, for the bridge over Clear Creek. H. O. Walker, County Clerk.

Gloucester, Mass.—A new bridge will probably be built over Gloucester Canal at a cost of $12,000. W. L. Webber, City Engineer.

Harrisburg, Pa.—The plans of the Pennsylvania R. R. for improvements at its union station in this city include an overhead passageway 40 ft. wide and 200 ft. long, to be enclosed with glass.

Jacksonville, Fla.—The Board of Public Works will be ready soon to get bids on the new Bridge street viaduct. Messrs. Hildreth & Co., of New York, are the engineers.

Kansas City, Mo.—Theo. S. Bates, of Worcester, Mass., has resigned as President of the Union Depot, Bridge & Terminal Co., which has river front property and rights to build a bridge over the Missouri River here. This project is on the site of the old Winner bridge.

Meridian, Miss.—Plans have been submitted to the Mayor for an overhead bridge over the railroad tracks at Fortieth avenue.

Missoula, Mont.—The Northern Pacific will change the alignment between Missoula and Bonner, which will require two large steel bridges.

Nevada, Mo.—Bids are wanted until Dec. 18 for a steel bridge over Duncan Creek near Amos. James M. Clack, Bridge Commissioner.

New Kensington, Pa.—An overhead bridge 10 ft. wide and 150 ft. long, it is said, will be built over the Pennsylvania R. R.

New York, N. Y.—The Department of Bridges is having plans made for the bridge at Hamilton avenue over Gowanus Canal, and if the money is available, it is probable that the contract will be let before the end of the year. The cost will reach $160,000.

Northeast, Md.—Bids are wanted at the January meeting of the County Commissioners for a bridge over Northeast Creek, at this town, the cost not to exceed $8,000. W. D. Bratton, of Elkton, is the Engineer.

Pittsburgh, Pa.—Those interested in the Western Bridge Co., which intends to bridge the Lackawanna between Pittsburgh and the North Side, are Chas. D. Meyer, J. A. Meade, G. B. Cooper, J. P. Torrence, R. F. Ramsey and others. Mr. Ramsey is President. The ordinance is still in Councils.

Remington, Va.—Bids are wanted by the County Commissioners until Dec. 11, for building three 68-ft. steel spans, one abutment and two piers. John K. Taliaferro, Commissioner.

Sacramento, Cal.—County Surveyor Boyd has submitted to the Supervisors plans and specifications for a steel bridge across Alder Creek 2½ miles this side of Folsom. They were referred to the Contract Committee with instructions to report later.

Sault Ste. Marie, Mich.—The Manitoulin & North Shore R. R. wants bids until Dec. 15 for some bridges. Z. A. Earle, Chief Engineer.

Scranton, Pa.—It is said that the plans for the West Lackawanna avenue viaduct have been approved and that work will be begun by Jan. 1. Address the Director of Public Works.

Steelton, Pa.—Application is about to be made for a charter to build a bridge over the Susquehanna between Steelton and New Cumberland.

Syracuse, N. Y.—Arrangements are being made by Frank J. Schnauber, City Engineer, preparatory to beginning work next spring on the two bridges, one over Onondaga Creek, and the other over Oswego Canal. The latter structure will cross at Butternut street, and the former at West Onondaga street.

Waycross, Ga.—The County Commissioners of Ware County are considering assisting in building a bridge across Satilla River between Ware and Pierce Counties.

Webster, S. Dak.—The County Commissioners want bids Jan. 7 for a steel bridge. Wm. Egeland, County Auditor.

Other Structures.

Beaver Falls, Pa.—A foundry and machine shop will be built here by the Eureka Manufacturing Co. of Pittsburgh. It is said the plans are now being made.

Bellefontaine, Ohio.—The Foundry & Machine Co., recently organized in this city, has been buying some land along the Big Four and Ohio Central railroads and is ready to begin work on its buildings.

Birmingham, Ala.—The Southern Car & Foundry Co. is preparing to double the capacity of its plant at Birmingham according to reports. The present output is 10 cars a day.

Charleston, S. C.—The Charleston Union Station Co. has been organized to build the proposed union station for Charleston. R. G. Erwin is President. It is said bonds to the amount of $300,000 will be issued.

Coplay, Pa.—The Coplay Mfg. & Cement Co. will build a new plant here and is receiving bids. The kiln building will be 224 x 142 ft.; clinker mill, 100 x 105 ft.; engine house, 50 x 79 ft., and stock house, 180 x 260 ft. There will also be a crushing mill, a conveyor house, etc.

Dayton, Ohio.—The Cincinnati, Hamilton & Dayton has petitioned the Council for the use of several streets on its site for a new station.

Hugo, Okla. T.—Plans have been submitted to the Commercial Club for the proposed shops to be built by the St. Louis & San Francisco in that place.

Jersey City, N. J.—The Lehigh Valley R. R. has filed plans with the Building Department of Jersey City for a freight shed at tidewater basin on Communipaw avenue. It will be three stories high, 558 ft. long and 288 ft. wide.

Long Island City, N. Y.—Among the improvements planned by the Long Island R. R. for next year are a number of new suburban stations. There will be underground passageways built at Woodhaven Junction, Freeport and Richmond Hill. Nothing will be done next year with the proposed station at Jamaica.

McKeesport, Pa.—The Baltimore & Ohio is preparing to build a new passenger and freight station here at a cost of about $75,000.

McKees Rocks, Pa.—The Crocker-Wheeler Electric Co., of Ampere, N. J., will supply the variable speed motors to drive the machinery in the new shops of the Pittsburgh & Lake Erie at McKees Rocks. The new machine shop, which is now building, will be 170 ft. wide by 560 ft. long.

Memphis, Tenn.—F. B. Young, of Memphis, has the contract to build the new Southern freight station on Charleston street. The building will be 400 ft. long.

Mexico City, Mex.—It is reported that a car works on a large scale is to be established in Mexico, a favorable concession having been granted.

Mobile, Ala.—The Mobile Railway Terminal Co. has been organized by Samuel Spencer and others of the Southern Ry., to build a terminal station, yards, etc., at Mobile.

Montreal, Que.—Local reports state that the Government is about to appoint a commission to investigate a report upon the advisability of building a dry dock at that city.

Napoleon, Ohio.—The Detroit Southern, according to report, has decided to remove its shops and division headquarters to Napoleon, as it has recently secured concessions from the municipal authorities. The new buildings will include a repair shop, roundhouse and train despatchers' office.

New Kensington, Pa.—The Westmoreland Boiler Co. has recently been formed and will build a plant at New Kensington.

New Orleans, La.—The Southern Pacific and the Illinois Central, according to local reports, will join in building a union station.

Newport News, Va.—The Chesapeake & Ohio Ry. is reported receiving bids on car shops to be built at Newport News.

Omaha, Neb.—Fire in the old shops of the Union Pacific caused a loss of about $150,000.

Pittsburgh, Pa.—The Union Spring Mfg. Co., recently organized in Pittsburgh, has bought the old plant of the Hussey Steel Co., at New Kensington, which is now being refitted to make railroad car springs, etc.

Portland, Me.—John W. Burrowes, of Portland, has been awarded the contract to build the new passenger station of the Grand Trunk in Portland, which was recently described and illustrated in the *Railroad Gazette*.

St. Louis, Mo.—Condemnation proceedings have been begun preparatory to building the extensions to the terminal which it is estimated will cost about $200,000.

Stratford, Ont.—The Grand Trunk is considering enlarging its car shops at Stratford and may abandon some of the smaller ones in the vicinity.

Tacoma, Wash.—A despatch says that the Chamber of Commerce of that city is negotiating with capitalists in regard to building a car building plant in Tacoma. H. H. Warner, Master Mechanic of the Northern Pacific Ry. at South Tacoma, is said to have made a report on this subject.

Washington, Pa.—The Pennsylvania R. R. proposes to build a new passenger station here at a cost of $40,000.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvi.)

Master Car Builders' Association.

The Committee of the Master Car Builders' Association will meet at Buffalo, Dec. 10, to decide upon the place for the 1903 meeting.

Canadian Society of Civil Engineers.

At the ordinary meeting on Thursday, Dec. 4, at 8 p.m., at 877 Dorchester street, Montreal, a paper was read by Mr. H. J. Cambie on "An Unrecorded Property of Clay."

American Society of Civil Engineers.

On Wednesday, Dec. 3, at 8:30 p.m., there was a regular business meeting of the Society. Ballots for membership were canvassed, and a paper entitled "Virtual Grades for Freight Trains," by A. C. Dennis, M. Am. Soc. C.E., was presented for discussion. This paper was printed in "Proceedings," for November, 1902.

The 50th annual meeting will be held at the house of the Society, No. 220 West 57th street, New York, on Wednesday and Thursday, Jan. 21 and 22, 1903. The business meeting will be called to order at 10 o'clock on Wednesday morning. The annual reports will be read, officers for the ensuing year elected, members of the Nominating Committee appointed, the proposed amendment to the Constitution (see p. 292 of *Proceedings* for October, 1902) will be considered, and other business transacted. The arrangements for excursions and entertainments will be announced later.

Southern & Southwestern Railway Club.

The Southern and Southwestern Railway Club held its annual meeting Nov. 20 and elected the following officers:

President, Julian R. Lane, General Manager of the Macon & Birmingham, Macon.
First Vice-President, L. B. Rhodes, Master Mechanic of the Georgia, Southern & Florida, Macon.
Second Vice-President, Samuel Higgins, Mechanical Superintendent of the Southern Railway.
Treasurer, Charles G. Lippold.
Secretary, W. A. Love.
Assistant Secretary, A. J. Merrill.

American Institute of Electrical Engineers.

A meeting of the American Institute of Electrical Engineers was held Nov. 21 in New York City. The topic for the evening was "Variable Speed Control for Electric Motors," particular attention being paid to the adaptation of the motor for driving machine tools. Papers were read by Messrs. Fowler, Coho, Keilholtz, Blackwell, Leonard, Storer and Lozier. In these papers a number of different methods were described by means of which a variation in speed of the electric motor to meet the requirements of the machine shop might be attained. Following the reading of the papers the usual discussion took place. The remarks of Mr. Charles Day, the "modernizing engineer," were particularly well received as he brought up an entirely new phase of the question. Mr. Day called attention to the fact that the motor question was only one side of a most comprehensive problem which confronted the manufacturer who wished to increase his shop efficiency. He cited instances where the introduction of motor drives into the machine shop had not resulted in the economies expected, simply because the other elements had not been considered. With the introduction of the new tool steels, higher cutting speeds and feeds were possible and in many cases the old tools were not strong enough to stand these high speeds. To obtain the maximum shop efficiency, not only must the motor question be considered in connection with the tool and the tool steel to be used, but the nature of the material to be machined enters into the problem. In conclusion, Mr. Day told of the interesting investigation which he had carried on with his associate, Mr. Kern Dodge, into the methods of modernizing the machine shop.

PERSONAL.

—Mr. Frank A. Dean, General Freight Agent of the Pittsburgh & Lake Erie since 1885, died Nov. 29. Mr. Dean was born in Pittsburgh and was about 52 years of age. He was formerly General Freight Agent of the Pittsburgh & Western.

—Mr. H. W. Hill, of Greenville, was, on Nov. 24, appointed Railroad Commissioner of Georgia for a term of six years, to begin on Oct. 15, 1903. He will succeed Mr. Spencer R. Atkinson, of Atlanta, who is at present Chairman of the Board.

—Mr. George Pierce, Superintendent of Marine Construction of the New York, New Haven & Hartford, died suddenly at his home in Newport, R. I., Nov. 26, aged 73 years. Mr. Pierce designed and built several of the Fall River Line steamers.

—In our account of the fire on the tower of the new East River Bridge we spoke of the gallantry of Mr. Kingsley L. Martin, Assistant Engineer. The Mayor has just sent him the following letter: "Through the Commissioner of Bridges I have heard of your gallant conduct on the occasion of the fire on the Williamsburg Bridge. It gives me much pleasure to add to the commendation already received from the Commissioner the assurance of my own high appreciation of your highly creditable conduct on that occasion."

—Mr. Charles K. Dixon, Division Superintendent of the Illinois Central, who was recently granted leave of absence owing to ill health died in Cherokee on Nov. 20. Mr. Dixon was born in Canada in 1846 and served three years with the union army in the Civil War. He began his railroad service with the Illinois Central in 1864 and his entire service had been with this company.

—Mr. J. J. Allen, General Traffic Manager of the National Railway of Tehuantepec, died in London, Wednesday, Nov. 26. Mr. Allen was for some years the General Agent in Mexico of the Ward Line steamships. For about three years (1880-1883) he was in Chicago with the United States Express Company and in 1884 he became connected with the Mexican Central.

—Mr. W. B. Poland, who in November succeeded Mr. Fritch as Superintendent of the Indiana Division of the Baltimore & Ohio Southwestern at Cincinnati, is a graduate of the Massachusetts Institute of Technology. In 1891 he was on River and Harbor surveys, and later was Superintendent of Construction in charge of "Point Judith Harbor of Refuge" off the Rhode Island coast. For five years, 1892-1897, he was Assistant Engineer of Maintenance of Way on the Chicago Division of the Cleveland, Cincinnati, Chicago & St. Louis. Two years later he went with the Baltimore & Ohio Southwestern as Engineer of Construction on the Mississippi Division and in September, 1899, was appointed Division Engineer. Mr. Poland continued as a Division Engineer for this company until his appointment as above.

—We told a week or two ago of the knighting of Mr. Frederick Harrison, General Manager of the London & North Western. Sir Frederick Harrison was born in 1844, and began his railroad career in the service of the Monmouthshire Railway & Canal Company, of which his father, Geo. Harrison, was Secretary and Manager. In 1864 he entered the service of the London & North Western under Sir Geo. Findlay, then District Superintendent at Shrewsbury, and when that gentleman was transferred to London to be General Goods Manager, Mr. Harrison went with him. In 1872 he became Assistant District Superintendent at Liverpool, and afterwards Superintendent of the Chester & Holyhead section. In 1875 he returned to Euston as Assistant Superintendent of the Line, and shortly afterwards Assistant to the General Manager. Upon the retirement of Mr. Thos. Kay in 1885, the directors appointed him Chief Goods Manager, and in 1893, upon the death of Sir Geo. Findlay, he succeeded to the post of General Manager.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—J. H. McGoff, heretofore Division Master Mechanic of the Northern Pacific, has been appointed Division Master Mechanic of the A., T. & S. F., with headquarters at Ft. Madison, Iowa, succeeding H. T. Herr, resigned.

Atlantic Coast Line.—H. M. Emerson, heretofore Assistant Traffic Manager, has been appointed Traffic Manager, succeeding T. M. Emerson, who was recently elected Third Vice-President.

Baltimore & Ohio.—Bruce W. Duer has been appointed Superintendent of the Pittsburgh Division, succeeding S. P. Hutchinson, resigned, effective Dec. 1.

Burlington & Missouri River in Nebraska.—On Dec. 1 the Wyoming Division was divided. The main line and branches east of Newcastle will be known as the Alliance Division and all lines west of that point will be known as the Sheridan Division. J. R. Phelan

becomes Superintendent of the Alliance Division and E. Gillette Superintendent of the Sheridan Division.

Chicago, Burlington & Quincy.—George H. Crosby has been appointed Assistant Freight Traffic Manager of the Burlington System, with headquarters at Chicago. Mr. Crosby has hitherto been General Freight Agent of the lines west of the Missouri River at Omaha.

Chicago Great Western.—Charles E. Dafoe has been appointed Superintendent of the Northwest Division, succeeding J. A. Kelly, resigned. Charles S. Weston succeeds Mr. Dafoe as Superintendent of the Wisconsin, Minnesota & Pacific Division.

Chicago, Milwaukee & St. Paul.—F. D. Tucker, heretofore Trainmaster, has been appointed Division Superintendent, with headquarters at Aberdeen, S. Dak., succeeding C. H. Scott, resigned.

Cleveland, Akron & Columbus.—L. S. Kinnaird, heretofore Assistant Master Mechanic of the Pennsylvania Company (Northwest System), has been appointed Master Mechanic of the C., A. & C., with headquarters at Mt. Vernon, Ohio, succeeding John Dalman.

Colorado & Southern.—At a meeting of the stockholders held recently F. P. Odom was elected a Director.

Duluth, South Shore & Atlantic.—W. F. Fitch, Second Vice-President and General Manager, has been elected President, succeeding Samuel Thomas.

Fort Worth & Denver City.—The position of General Freight Agent has been created and W. F. Sterley, Assistant General Freight and Passenger Agent, appointed to the new position. The position formerly held by Mr. Sterley has been abolished.

Kansas City, Mexico & Orient.—W. G. Purdy and G. J. Gould have been elected Directors.

Lake Erie, Alliance & Wheeling.—Geo. A. Sawyer has been appointed General Freight and Passenger Agent, with headquarters at Alliance, Ohio.

Little Kanawha.—W. S. McFetridge has been appointed Assistant Chief Engineer, with headquarters at Parkersburg, W. Va., succeeding R. P. Van Dusen, resigned, effective Dec. 1.

Mexican International.—L. M. Johnson, General Manager, has resigned. W. Jennings, Superintendent of the Mechanical Department, has also resigned. J. J. Waters succeeds Mr. Jennings at C. Porfirio Diaz, Mex.

Montana Central (Great Northern).—James H. O'Neil, heretofore Trainmaster, has been appointed Division Superintendent.

Norfolk & Western.—A. C. Needles, Superintendent of Norfolk Division, has been appointed Superintendent of the Pocahontas Division, with headquarters at Bluefield, W. Va., and W. S. Becker succeeds Mr. Needles as Superintendent of Norfolk Division at Crewe, Va.

Northern Pacific.—J. H. McGoff, Division Master Mechanic at Gladstone, Minn., has resigned. (See Atchison, Topeka & Santa Fe.)

Pennsylvania.—J. M. James has been appointed Master Mechanic of the Olean Shops, with headquarters at Olean, N. Y., succeeding J. H. Magee, Jr., deceased.

W. F. Kapp, Master Mechanic at Columbia, Pa., has resigned to take a similar position with the Richmond, Fredericksburg & Potomac.

The office of General Counsel has been created and General Solicitor George V. Massey has been appointed General Counsel. Francis I. Gowen, formerly President of the Choctaw, Oklahoma & Gulf, has been appointed General Solicitor of the Pennsylvania, succeeding Mr. Massey.

S. J. Dillon, heretofore General Foreman, has been appointed Master Mechanic, with headquarters at South Amboy, N. J.

Pennsylvania Company.—M. S. Tracey has been appointed Assistant Master Mechanic (Northwest System) with headquarters at Allegheny, Pa., succeeding L. S. Kinnaird. (See Cleveland, Akron & Columbus.)

Richmond, Fredericksburg & Potomac.—See Pennsylvania.

St. Louis, Memphis & Southeastern.—On Nov. 28 the following appointments took effect: E. F. Blomeyer, General Freight and Passenger Agent, with headquarters at Cape Girardeau, Mo.; M. W. Wambaugh, Chief Engineer, at St. Louis, Mo.; C. M. Hunt, Superintendent of the Cape Division (Cape Girardeau to Hoxie, Mingo to Hunter, Shepley to Paw Paw Junction) at Cape Girardeau; W. G. Tiffany, Superintendent of the Memphis Division, at Caruthersville, Mo., and J. R. Hawkins, Superintendent of the St. Louis Division, at Ste. Genevieve, Mo.

Southern.—M. K. Barnum, heretofore Division Master Mechanic of the Union Pacific, has been appointed Assistant Mechanical Superintendent of the Southern, with headquarters at Washington, D. C.

Union Pacific.—Since Nov. 1, the officers named herein have had jurisdiction as follows: The Superintendent of Transportation has been in charge of all matters pertaining to the transportation service, and the following officers will report to him: The Superintendent of Telegraph, Superintendent of Dining Car Service, Car Service Agent and the Special Agent. The Superintendent of Motive Power and Machinery has been in charge of all matters pertaining to the motive power (including its distribution), car equipment, and the operation and management of the company's shops. The Chief Engineer has been in charge of surveys, and matters pertaining to new construction and to maintenance of way and structures, and Division Superintendents have reported to, and received instructions from, the above-named officers, in matters pertaining to their respective departments. William David Lincoln has been appointed Car Service Agent, with headquarters at Omaha, Neb.

M. K. Barnum, Division Master Mechanic at Omaha, Neb., has resigned. (See Southern.)

Wabash.—F. H. Paine, Assistant Master Mechanic, with headquarters at Chicago, has resigned.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALBANY & SYRACUSE ELECTRIC.—See Railroad News.

ALASKA CENTRAL.—Preliminary surveys for the portion of this projected line which it is proposed to build next season have now been completed and it is thought that grading will begin in April. Thirty-five miles have been located on the Southern Division out of Resurrection Bay, Alaska. Colonel C. H. Anderson is Chief Engineer and may be addressed at Seattle, Wash. (Oct. 31, p. 845.)

ATCHISON, TOPEKA & SANTA FE.—An officer writes that the main line of the Eastern Oklahoma, from Newkirk to Paul's Valley, will be 183 miles long. Branches

from Pawnee to Esau and Ripley to Cushing add 16 miles, making a total of 199 miles, of which 70 per cent. is graded and about 40 per cent. of track laid. The accompanying map shows work completed and in progress in Oklahoma.

BENNETTSVILLE & OSBORN.—An officer writes that work will begin during the next 10 days on this projected line from Bennettsville to a connection with the Seaboard Air Line at Kollock, S. C. J. A. Drake, of Bennettsville, is President.

BIG BLACKFOOT MILLING CO.—Local press reports state that this company has announced its intention of building a logging road from Bonner, Mont., to timber lands in the Blackfoot Valley, and that surveys are now being made. John R. Toole, Missoula, Mont., is President.

BOCA & LOYALTON.—An officer writes that surveys are being made for an extension from Beckwith to Westward, Cal., six miles. The line is now being worked between Boca and Beckwith, by way of Loyalton, a distance of 40 miles, connection with the Southern Pacific being made at Boca. W. S. Lewis, Loyalton, Cal., is General Manager.

BROOKSVILLE & HUDSON.—An officer writes that, in addition to the track laid during the current year, work is in progress on an extension from the present terminus of the line to Hudson, Fla., 10 miles, and that it is intended to build also from Enville to Tampa, 36 miles. Grading is being done by day's work. B. F. Ulmer, Savannah, Ga., may be addressed. (Feb. 21, p. 137.)

CAMDEN & TRENTON (ELECTRIC).—Work was begun at Trenton, N. J., Nov. 29, for the proposed electric line between Burlington and Trenton, 20 miles.

CANANEA, YAQUI RIVER & PACIFIC.—An officer writes that it is proposed to build under charter of the Arizona & Colorado from Naco, Ariz., to a point at or near Cochise, Ariz., about 65 miles. Epes Randolph, Los Angeles, Cal., is President and General Manager. (July 18, p. 579).

CAPE BRETON.—According to most recent advices, contracts are likely to be let next spring for the projected extension from St. Peters to Louisburg, Cape Breton, 53 miles. The line has been completed from the Strait of Canso to St. Peters, 30 miles.

CENTRAL OF ALABAMA.—An officer writes that 41 miles have been located on the projected extension from New Decatur, Ala., to Tuscaloosa, 160 miles, and that surveys are now in progress for the remainder of the route. It is said that bids will be asked next spring. John Carlisle, Cincinnati, Ohio, is President. (Aug. 29, p. 681.)

CHIPPEWA VALLEY & NORTHERN.—An officer writes that about 1½ miles of track has been laid on this line in Wisconsin during 1902 and that it is proposed to build 12 miles additional in the near future. The road is projected from Bruce, Wis., on the Minneapolis, St. Paul & Sault Ste. Marie, to Haywood, 50 miles north. About 10 miles were built during 1901. Daniel J. Arpin, Grand Rapids, Wis., is President.

CHOCTAW, OKLAHOMA & GULF.—An amendment to the charter of the Choctaw, Oklahoma & Texas, the Texas corporation of the above, has been filed at Austin, providing for an extension from Amarillo, Texas, west to the New Mexico line, 72 miles, and it is understood that the line will be continued ultimately to a connection with the El Paso line of the Rock Island System at Tecumsecari, N. Mex. (Aug. 22, p. 664.)

DALLAS, CLEBURNE & SOUTHWESTERN.—An officer writes that Dougherty & Davis, contractors, are just finishing track laying on the first 10 miles of this new line in Texas. Prospects of continuing immediately to Dallas, 27 miles further, are excellent, although the matter has not yet been decided. The section completed extends from Cleburne to Egan, and connects with the Missouri, Kansas & Texas. Maximum grade, 1 per cent.; maximum curvature, 4 deg.; work light. W. D. Myers, Cleburne, Texas, is President, and H. A. Genung is Chief Engineer.

DAYTON, LEBANON & CINCINNATI.—An officer writes that three miles of track have been laid this year between Hempstead and Lambeth, Ohio, and that three miles additional are now under contract to the Great Northern Construction Co., of Columbus, Ohio.

DELAWARE & NORTHAMPTON.—Bids are wanted for the projected line in Northampton County, Pa., from a point near Sandt's Eddy to Stockertown, six miles. B. S. Dunn, 25 Broadway, New York, is President.

DELAWARE VALLEY.—An officer writes that surveys have been completed for the projected extension from Stroudsburg to Saylorsburg, Pa., 13 miles, in addition to new mileage built this year.

DENVER, NORTHWESTERN & PACIFIC.—Announcement of the route for the first 36 miles of this projected line was made at Salt Lake City Nov. 27, and bids were asked by the Colorado-Utah Construction Co., the general contractors. Work on the first section will begin at the end of the grade built by the Denver & Northwestern Co., and will carry the road to a point within 10 miles of the main range tunnel, 51 miles from Denver. The cost of the road to this point will be approximately $3,000,000. The work for which bids have been asked is grading, filling and excavating, and it is estimated that 2,275,000 cu. yds. of rock will have to be taken out. Contracts will call for the completion of the first section of the road by Sept. 1, 1903. The remainder of the route as far west as Kremling, across the range, is said to have been practically decided on, and includes a loop back from the end of Boulder Canyon to Jenny Creek. The main range tunnel will be 2¼ miles long. General Manager Ridgeway, of the Colorado-Utah Construction Co., may be addressed at Denver.

DUE WEST-DONALD'S.—An offer has been made to the citizens of Due West, Ala., by F. J. Lockhart, of Augusta, Ga., to build a railroad from their town to Donald's, four miles distant, on the line of the Southern, if they will subscribe for $12,000 worth of bonds after the road is completed. The matter is now under consideration.

DULUTH, SOUTH SHORE & ATLANTIC.—The line from Calumet to Laurium, Mich., three miles, has been completed. (Official.)

EASTERN OF NEW MEXICO (ATCHISON, TOPEKA & SANTA FE).—Bids for this projected line, illustrated in our issue of Nov. 14, page 882, have been opened. The line, as projected, will be about 275 miles long.

EDMONDTON & PEACE RIVER.—Application will be made at the next session of the Dominion Parliament to incorporate a company under this title to build from Edmondton, Alberta, by way of Lesser Slave Lake and the Peace Valley, to Pine River, B. C.

FISH RIVER.—This new line from Ashland, on the Bangor & Aroostook, to Fort Kent, on the St. John River, Me., approximately 50 miles long, will be opened Dec. 8, according to press reports. This is the most northerly road in the State of Maine and will open up an undeveloped timber country. Franklin W. Cram, Bangor, Me., is President.

GREAT NORTHERN OF CANADA.—It is said that this company, besides building a branch from St. Sauveur to connect with its main line at St. Jerome, Que., will build from St. Jerome to a connection with the Chateauguay & Northern at Bout de'Lisle. This is under the charter of the Montford & Gatineau Colonization Ry.

HARBOR SPRINGS.—An officer writes that it is proposed to build five miles into timber in the near future. No work was done during 1902 on account of the high prices prevailing for rails. The line is now worked between Harbor Springs and Race Mill, Mich., eight miles, carrying freight and passengers, as well as lumber. E. Shay, Harbor Springs, Mich., is President.

HAYNEVILLE-MORGANVILLE.—It is said that a road eight miles long will be built from Hayneville, Ala., to Morganville, on the Louisville & Nashville, by W. P. McGaugh, of Hayneville, and others.

HEALD TIMBER CO.—An officer writes that 15 miles of line are now building out of Coleman's, Va., in addition to five already built during the present year. The line is designed to carry timber exclusively and the company is doing its own work. John H. Heald & Co. may be addressed at Lynchburg, Va.

INDIANA HARBOR.—Articles of incorporation for this company were filed at Indianapolis, Nov. 25. It is proposed to build from East Chicago to Terre Haute, Ind., 200 miles. It is not known whether this project is allied to the one reported in our issue of June 20, under a similar title, for an electric line from Indiana Harbor to Chicago. John R. Walsh, of Chicago, is said to be interested. (June 20, p. 486.)

KINGSTON & PEMBROKE.—Application will be made at the next session of the Dominion Parliament to extend the time to build the lines authorized. The company now intends to build to a junction with the Pontiac Pacific Junction R. R., which is controlled by the Canadian Pacific. The line, as now worked, extends from Kingston to Renfrew, 104 miles.

LAKE ERIE, YOUNGSTOWN & SOUTHERN.—Charter was granted this company, Nov. 21, to build from Youngstown, Ohio, to Poland, North Lima and limestone regions in the Mahoning Valley. H. G. Hamilton, of Youngstown, is interested.

LAKE SUPERIOR & ISHPEMING.—An officer writes that the branch line from Eagle Mills, Wis., to the Maas mine, four miles, is being worked by McDowell Bros. & Co., contractors, who may be addressed at Marquette, Mich. (Oct. 17, p. 805.)

LITTLE KANAWHA.—An officer writes that work is now in progress on the Burnsville & Eastern extension from Sandy Bend to Burnsville, W. Va., 71 miles, by F. H. Clements & Co., and John H. Miller, contractors, of Philadelphia, Pa. Surveys are also being made for the Burnsville & Eastern from Burnsville to Belington, W. Va., 65 miles. A connection with the West Virginia Central & Pittsburgh will be made at Belington. (Oct. 17, p. 805.)

MANITOULIN & NORTH SHORE.—Tenders will be received until Dec. 15 to build the following section: From

Meaford to Tobermory, Ont., 72 miles; from Fitzwilliam Island to the Gertrude mines, 28 miles, and from Sudbury to Sault Ste. Marie, approximately 180 miles. The exact route of the latter extension, however, has not as yet been fixed. Z. A. Earle, Chief Engineer, may be addressed at Sault Ste. Marie.

MEXICAN CENTRAL.—Preliminary surveys are reported completed for an extension from San Antonio, Texas, to the Frio River, about 50 miles south.

MEXICAN INTERNATIONAL.—An officer writes in regard to the report that the Mexican Government had approved the survey for an extension from Durango to Mazatlan, crossing the Sierra Madre mountains, that the Government approval has been obtained. This, however, although an essential before work can be done, signifies very little as to the company's immediate intentions of building, and it is impossible to say at the present time when work will be begun. (Nov. 21, p. 902.)

MISSOURI ROADS.—It is said that Carlisle & Co., of Kansas City, intend to build a railroad through extensive tracts of pine timber lands recently acquired by them in the eastern part of Texas, and that rights of way have been acquired from a point on the Missouri, Kansas & Texas to a connection with the Warren, Corsicana & Pacific, about 40 miles distant.

MOBILE, JACKSON & KANSAS CITY.—An officer writes that Smith & Merrill, general contractors, are now building an extension 100 miles long from Beaumont to Decatur, Miss., in addition to the track laid during the current year. H. H. Lane, Mobile, Ala., may be addressed.

MONTANA R. R.—Sale of about 70 acres of State lands in Meagher and Fergus Counties, Mont., has been made to this company for right of way for its new line from Harlowton to Lewistown. Work was reported begun in our issue of Nov. 28, page 918, by the Utah Construction Co. Robert Rantoul, Helena, Mont., is General Manager.

MONTFORD & GATINEAU COLONIZATION.—See Great Northern of Canada.

NEW MARTINSVILLE, SISTERSVILLE & MIDDLEBOURNE (ELECTRIC).—According to most recent advices, work will begin on this projected electric line between the points named in West Virginia about Jan. 1. The distance is about 20 miles. John A. Howard, of Wheeling, W. Va., and Robert Miller, of Pittsburgh, are interested. (Oct. 17, p. 806.)

NEW ORANGE & FOUR JUNCTION.—An officer writes that surveys have been made for an extension from New Orange to Summit, N. Y., five miles. Wm. W. Cole, 290 Broadway, New York, is President.

NOME-COUNCIL CITY.—Further particulars concerning this projected line in the Yukon region indicate that the builders will be the Pioneer Mining Co., headed by E. O. Lindbloom, J. Lindeberg and others of Alaska. After the main line is built between the points named, it is intended to extend to Salmon River and Casa de Paga. (Nov. 14, p. 882).

NORTHERN PACIFIC.—Press reports say that a cut-off will be built through the Bad Lands of North Dakota, from Belfield to the head of Green River, and thence to a point about four miles west of Sentinel Butte, where connection will again be made with the main line. The purpose of this line is to avoid grades.

PARAGOULD & MEMPHIS.—This company, which was reported in our issue of Aug. 29, page 682, as having absorbed the Cardwell & Big Lake, has been chartered to build from Paragould, Ark., to Cardwell, Mo., and Osceola, Ark., 14 miles of the line being in Missouri, and approximately 38 miles in Arkansas. J. E. Thomas, Cardwell, Mo., may be addressed.

PEARL & LEAF RIVER.—An officer writes that, in addition to the track laid during 1902, it is proposed to build from Blountville to Natchez, Miss., 110 miles. No surveys have been made for this as yet. W. A. Stevenson, Hattiesburg, Miss., is President.

PENNSYLVANIA.—It is said that at a meeting of directors, Nov. 26, improvements were authorized which will aggregate over $10,000,000. Of this, approximately $3,000,000 is to be spent on improvements between Philadelphia and Harrisburg, including surveys for a new low-grade line from Cressville across Lancaster and Chester counties, to a connection with the main line at Atglen, 30 miles. Six million dollars is also to be spent on the Lines West, including double tracking between Pittsburgh and Chicago on the Pittsburgh, Fort Wayne & Chicago; double tracking on the Cleveland & Pittsburgh Division between Hudson and Ravenna, etc. Surveys for a new line from Lawrence Junction, on the Pittsburgh, Fort Wayne & Chicago, to Redbank, on the Allegheny Valley, were also authorized. Approximately $1,500,000 will be spent by the Pittsburgh, Cincinnati, Chicago & St. Louis on second track work west of Columbus, etc.

Contracts for grading and track laying for large classification yards at Fairview, on the Northern Central, and for additional freight tracks at other points between Harrisburg and Pittsburgh, were let on Nov. 20 to the H. S. Kerbaugh Co., of Philadelphia.

PENNSYLVANIA, NEW YORK & LONG ISLAND.—The State Railroad Commission has granted permission to the Pennsylvania to carry out its project of connecting its lines at Jersey City and at Long Island City by means of a tunnel through Manhattan and under the rivers. The only obstacle to be encountered is the opposition of the New York Aldermen, chiefly on account of the labor clause which they desire inserted, but it is not thought probable that serious difficulty or delay will ensue before the bill is passed.

PERRY COUNTY R. R.—Surveys have been completed for an extension from Loysville, Perry Co., Pa., to Honey Grove, Juniata Co., Pa., 18 miles. Chas. H. Smiley, New Bloomfield, Pa., is President. (Official.)

PITTSBURGH, CARNEGIE & WESTERN (WABASH).—An officer writes that the following portions of the line are now building for the Wabash connection into Pittsburgh: From Pittsburgh to the West Virginia State line, 36½ miles; from the West Virginia State line to the Ohio River, 32 miles; from the Ohio River to Jewett, 20 miles. J. W. Patterson, Pittsburgh, Pa., is Chief Engineer.

PITTSBURGH, LISBON & WESTERN.—An officer writes that surveys have been made from New Galilee to New Castle, Pa., 14 miles, and from Lisbon to Minerva, Ohio, 21 miles. The line as now worked extends from New Galilee to Lisbon, 25 miles. N. B. Billingsley, Lisbon, Ohio, is President.

RALEIGH & CAPE FEAR.—An officer writes that the extension from Sippahaw to Lillington, N. C., 14 miles, is under contract to Stewart & Jones, of Clifton, Va. John A. Mills, Raleigh, N. C., is President. (Aug. 8, p. 632.)

REGISTER & GLENVILLE.—An officer writes that it is proposed to build from the present terminus at Coe, Ga., to Glenville, seven miles. The road is now being worked between Register and Coe, 35 miles. Governor C. Perkins, Hagan, Ga., is General Manager.

RICHMOND BELT.—Proposals will be received until 11 a. m., Dec. 15, for excavating 200,000 cu. yds., and for building the roadbed for the first section of four miles, beginning 10 miles from San Francisco, in Contra Costa County, Cal., work to begin 90 days after contract is signed and to be completed within six months. Bids must be accompanied with a certified check for 10 per cent. of the amount bid. Specifications may be had by application to Wm. S. Tevis, President, Room 104, Crocker Bldg., San Francisco.

RUTHERFORDTON, HICKORY NUT GAP & ASHEVILLE.—Preliminary surveys are reported for this projected line between Asheville and Rutherfordton, N. C. They are being made by J. J. Dalton. This may be the same project referred to in our issue of July 4, p. 543, as the Asheville & Rutherfordton. Geo. H. Lambert may be addressed at Asheville, N. C.

RUTLAND-MONTPELIER.—Local press reports state that a company has been formed to build a railroad across Vermont between the points named, a distance of about 60 miles. Dr. W. Seward Webb is said to be interested.

SAVANNAH & STATESBORO.—At a meeting of the stockholders, Nov. 18, it was decided to extend the line 20 miles in the direction of Swainsboro, Ga. A meeting will be held this month to authorize a bond issue. The line is now worked between Savannah and Statesboro, 55 miles. Cecil Gabbett, Savannah, Ga., is President.

SOUTHERN PACIFIC.—According to most recent advices, trains will be run over the new track between Elko and Carlin, Nev., within the next 30 days. There will be 40 miles of new track between these points, constituting a portion of the rebuilt line across Nevada. (Oct. 3, p. 766.)

SPEEDWAY & SCRANTON LAKE.—This company was chartered in Pennsylvania, Nov. 26, to build a steam railroad two and a half miles long from the northerly side of Nay Aug Park, Scranton, Pa., to the Speedway Hotel. Dr. George E. Hill, Dunmore, Lackawanna Co., is President.

SUFFOLK & CAROLINA.—An officer writes that work is in progress on an extension 23 miles long, from Trotville to Elizabeth City, N. C., in addition to track laid during 1902.

TEXAS ROADS.—The State Penitentiary authorities have built a line about six miles long from the sugar mill on the State convict plantation, in Brazoria County, with a landing on the Brazos River, and they intend to build a system extending to every part of the 8,000 acre plantation in the immediate future.

TEXAS, SABINE VALLEY & NORTHWESTERN.—Surveys are reported for an extension from Boren to Center, Texas, 28 miles, and it is understood that contracts have been made with towns along the route guaranteeing the completion of the line by Sept. 15, 1903. The line is now worked in connection with the Marshall, Timpson & Sabine Pass and runs from Longview Junction, Texas, where connection is made with the Texas & Pacific, to Timpson, 60 miles. G. M. D. Grigsby, Longview Junction, is President and General Manager.

TRANSYLVANIA.—An officer writes that an extension 10½ miles, is now being built between Toxoway and Lake Toxoway, N. C. J. R. Oates, Asheville, N. C., is the contractor. The line is now worked between Hendersonville and Toxoway, N. C., 31 miles. J. F. Hayes, Brevard, N. C., is General Manager.

TRINITY & BRAZOS VALLEY.—Work is reported begun on the new line projected from Corsicana, Texas, to Beaumont. It is said that the section from Cleburne to Mexia, about 75 miles, will be built first. J. H. B. House, of Houston, is President. (Nov. 28, p. 918.)

VENTURA (ELECTRIC).—According to most recent advices, track laying on this new electric line between Ventura and Sunset, Cal., 125 miles, will be begun early next year, and extension to Bakersfield, 40 miles beyond, is also projected. The line will be equipped with the block system of signals.

VICTORIA BEACH (ELECTRIC).—According to most recent advices, ten miles of this projected line from Middleton, Annapolis County, to Victoria Beach, Ont., has been graded. The total distance is 40 miles. J. O'Brien, of Ottawa, is the contractor.

WASHINGTON ROADS (ELECTRIC).—Control of all the electric traction lines in the vicinity of Puget Sound, Wash., is said to have been obtained by the firm of Stone & Webster, of Boston. A new line is to be built from Fairhaven to Lynden, 16 miles, constituting part of a projected suburban system designed to connect Whatcom and Tacoma with Everett and Seattle. The company has just let contracts for a power plant on the Puyallup River.

WESTERN OF ALABAMA.—An officer writes that the main line is being changed between Soapstone Bridge and Selma, Ala., seven miles.

WEST VIRGINIA SOUTHWESTERN.—This company has been chartered to build from Gordon's Siding, McDowell County, W. Va., to a point near the head waters of the Tug River. J. H. Hurt, of Abingdon, Va., and W. H. Hughes, of Welch, W. Va., may be addressed. The office of the company will be at Bristol, Washington County, W. Va.

WINFIELD & SOUTHERN.—This company has been organized in Kansas to build from Winfield into the coal fields of the Osage and Cherokee Nations. The three banks of Winfield, Kan., are included in the directorate. Surveys are to be made at once. Further information than this concerning the names of interested parties is not available at the present time.

YANKTON, NORFOLK & SOUTHERN.—This company has been formed as a consolidation of the projected Nebraska & Gulf and the Yankton, Norfolk & Southwestern lines. The latter is said to have about 75 miles of completed grade between Yankton, S. Dak., and Norfolk, Neb. It is proposed to build during 1903 from Yankton to Concordia, Kan. H. Leone Miller, Sutton, Neb., is President.

ZIMMERMAN, LEESVILLE & SOUTHWESTERN.—An officer writes that surveys are being made for an extension from Edwards to Mora, La., five miles, in addition to track laid this year. Work is being done by the company's forces. J. A. Bentley, Zimmerman, La., is President.

GENERAL RAILROAD NEWS.

AUBURN & SYRACUSE ELECTRIC.—N. W. Harris & Co. offer $300,000 of the issue of $2,000,000 first and refunding 5's of Oct. 1, 1902, which are subject to call at 110 in 1912, or thereafter. The company at present works 20 miles of line and has 16 miles additional now building and practically completed in the territory between Auburn and Syracuse, N. Y.

BROCKVILLE, WESTPORT & SAULT STE. MARIE.—This railroad, which runs from Brockville to Westport, Ont., 45 miles, connecting with the Canadian Pacific and Grand Trunk and with the New York Central & Hudson River by means of a ferry at Brockville, is ordered sold on Jan. 20, at Brockville. For further information address W. S. Buell, Brockville, Ont.

CHICAGO GREAT WESTERN.—The new issue of $6,500,000 additional common stock referred to in our issue of Nov. 7 will be applied as follows, according to the *Commercial and Financial Chronicle*: To purchasing the outstanding stock of the Mason City & Fort Dodge *Railroad*, $2,830,000; to purchasing outstanding stock of the Mason City & Fort Dodge *Railway*, $3,000,000; to purchasing outstanding stock of the Wisconsin, Minnesota & Pacific, not already owned, $670,000. The last named has $3,960,000 in bonds outstanding and operates 272 miles of line. The Mason City & Fort Dodge *R. R.* has $1,380,000 bonds outstanding which are a first mortgage on 92 miles of its 130 miles of line.

CINCINNATI, HAMILTON & DAYTON.—It is said that holders of the $1,800,000 7's maturing Jan. 1 will be offered in exchange new first mortgage refunding 4's on a basis which has not yet been announced. The company intends also to retire, as soon as possible, the $3,162,000 Indiana, Decatur & Western 5's which are redeemable at 110. Funds to provide for these issues will be obtained from the sale of the Cincinnati, Indianapolis & Western first mortgage and refunding 50-year 4's, guaranteed by the Cincinnati, Hamilton & Dayton.

COLORADO SPRINGS & CRIPPLE CREEK DISTRICT.—On Nov. 26, a mortgage for $3,600,000 was filed with the Morton Trust Co., of New York, trustee, to provide for a like amount of bonds, which will serve to retire the first and second mortgage bonds outstanding. A surplus of about $600,000 will remain, which is to be applied to betterments of the electric system. The company works about 70 miles of line; the greater part by steam, and the remainder by electricity.

CONNECTICUT RIVER R. R.—The Massachusetts Railroad Commissioners have given a hearing on the petition for authority to issue $969,000 20-year 3½ per cent. bonds, to redeem such portion of the $1,290,000 scrip maturing next January as is not covered by the sinking fund. A considerable annual saving in interest charges will be effected by the refunding. The Boston & Maine is lessee of the company.

GEORGIA SOUTHERN & FLORIDA.—Fifty-year 4 per cent. bonds to the amount of $2,000,000 were recorded on Nov. 25. They are part of $10,000,000 authorized, and have been issued in part payment of the Atlantic, Valdosta & Western property.

IOWA CENTRAL.—The report for the year ending June 30 shows gross earnings of $2,543,350, on 558 miles worked, an increase in earnings of $259,227 over last year. During the year passenger earnings increased 14.54 per cent., and freight earnings 11.93 per cent. Changes in the freight traffic were occasioned by a decrease of 21,275 tons in agricultural products carried, an increase of 123,952 tons in coal, coke and other products of mines, and an increase of 88,092 tons in other commodities. Expenses during the year were divided as follows: Conducting transportation, $1,021,665; maintenance of way and structures, $554,587; maintenance of equipment, $346,581, and general expenses, $113,014. The charge for equipment represents the cost of 100 flat cars, two mail cars and the cost of material necessary to build 150 stock cars, and the charge to betterments and improvements covers completion of the Des Moines River bridge, reduction of grades, change of alignment and ballasting 93 miles of track between Hampton and Albia, Iowa.

MANHATTAN RY. (NEW YORK).—The terms of the agreement by which this company will be leased to the Interborough Rapid Transit, are announced as follows: The rental from April 1, 1903, to Jan. 1, 1906, to be the net earnings of the Manhattan Co., not exceeding 7 per cent. After Jan. 1, 1906, the rental is to be 7 per cent. on the stock of the Manhattan Ry. Co., guaranteed by the Interborough Rapid Transit. To complete improvements already planned, Manhattan stock will be increased at once to $55,200,000 and will be given present stockholders at par. The total amount of $60,000,000 at some future date will also be provided for, with a view to further improvement of the property. In addition, the Interborough Company will allow $10,000 per year for organization expenses of the Manhattan Co.

PINE BLUFF & WESTERN.—This company has made a mortgage to the Illinois State Trust Co. of East St. Louis, trustee, to secure $1,200,000 6 per cent. 20-year bonds, dated Oct. 1, 1902, and subject to call at 105 in 1912.

PITTSBURGH, LISBON & WESTERN.—An officer writes in answer to inquiries that the capital stock has been increased from $1,000,000 to $5,000,000 and that the company has acquired the Salem R. R. and consolidated with the Shenango & Beaver Valley, as rumored in our issue of Nov. 7, page 864. (See also under Railroad Construction.)

PUEBLO & SUBURBAN TRACTION & LIGHTING.—The first meeting of this company was held at Pueblo, Colo., on Nov. 26, at which time its organization was completed by the election of officers. It is a consolidation of several power plants and electric lines in the vicinity of Pueblo, and will operate 50 miles or more of line.

WORCESTER & CONNECTICUT EASTERN (ELECTRIC).—Thompson, Tenney & Crawford, of New York and Boston, offer $2,050,000 first mortgage sinking fund 4½ per cent. bonds, dated Oct. 1, 1902, and due in 1943, without option of prior payment, the New York Security & Trust Co., trustee. The New York, New Haven & Hartford controls this company, which operates 47 miles of line from Worcester, Mass., to Wauregan, and extensions are being made. First mortgage bonds to the extent of $3,100,000 have been authorized and the remainder of these, after deducting the present issue, are held in escrow for extensions and acquirement of connecting lines, but only at the rate of 75 per cent. of the actual cost of the same. The mortgage is a first lien on all the franchises and property of the Worcester & Connecticut Eastern, the Peoples' Tramway and the Danielson & Norwich Street R. R., in addition to a number of leases, and first mortgage bonds as collateral.